

SALMON AQUACULTURE DIALOGUE

Draft standards for responsible salmon aquaculture

These draft standards are released for public comment by the Steering Committee of the Salmon Aquaculture Dialogue. The Steering Committee is composed of a representative from each of the following organizations:

Coastal Alliance for Aquaculture Reform
Canadian Aquaculture Industry Alliance
Marine Harvest Group
Norwegian Seafood Federation (FHL)
Pew Environment Group
SalmonChile
Skretting
Fundación Terram
World Wildlife Fund

This document contains draft standards that seek to minimize or eliminate the key negative environmental and social impacts of salmon farming, while permitting the industry to remain economically viable. In order to improve the industry's overall performance, the standards focus on today's best performers and are intended to be at a level where enough producers strive to achieve them, bringing about actual change on the ground. Once completed, the standards are intended to be revisited and updated periodically (e.g., every three to five years) to ensure that the standards are based on best available scientific knowledge and management practices and to encourage continuous improvement.

These draft standards do not represent final agreement by the Salmon Aquaculture Dialogue Steering Committee. The document is presented as a working draft that will benefit from public input. The standards are open for public comment from August 3 2010 through October 3 2010. Comments can be submitted via the website at www.worldwildlife.org/salmondialogue. Feedback received during the public comment period will be posted online and used to revise the draft standards. The Steering Committee expects to continue debating outstanding issues and developing alternatives based on public input, proactive outreach and further research during the next several months. The Steering Committee expects to hold a Dialogue meeting in October 2010, prior to releasing a second draft of the standards and opening a second public comment period.

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INTRODUCTION

Seafood is one of the most popular sources of protein worldwide. By volume, approximately half of the seafood we eat is wild caught. But the other half is from aquaculture, the fastest growing food production system in the world.

As with many rapidly growing industries, the growth in aquaculture production has raised concerns about negative social and environmental impacts related to farming, such as water pollution, the spread of diseases and unfair labor practices at farms. Although there are some businesses addressing these issues well, others are not doing so at all or are doing so poorly.

One tool to help encourage more responsible aquaculture is global standards – performance levels that must be reached to help minimize or eliminate a set of key impacts. Standards can serve as the basis for a certification program. They also can be used to benchmark other standards, incorporated into existing certification programs, adopted for government programs, and be the foundation for buyer and investment screens. Through the Salmon Aquaculture Dialogue (SAD) roundtable, global performance-based standards are being created for salmon farming.

PURPOSE AND SCOPE OF THE SALMON AQUACULTURE DIALOGUE STANDARDS

The SAD is a science-based forum initiated by World Wildlife Fund (WWF) in 2004. The goal of the Dialogue is to credibly develop measurable, performance-based standards that minimize or eliminate the key negative environmental and social impacts of salmon farming, while permitting the industry to remain economically viable.

More than 500 stakeholders, including producers, environmental and social non-governmental organizations (NGOs), seafood buyers, scientists, and government representatives have participated in the Dialogue. A nine-person Steering Committee (SC) is responsible for managing the SAD process and making all final decisions related to the salmon standards document. This group of volunteers includes representatives from salmon producer associations and companies, feed manufacturers, and environmental and social NGOs. More information on the Dialogue, including meeting summaries and reports on key issues that were commissioned by the Dialogue, is available at <http://www.worldwildlife.org/salmondialogue>.

Definition of Standards

The Dialogue is an iterative, participatory process that began with identifying the key environmental and social impacts of salmon production. Using a step-wise process, the Dialogue is building agreement on principles, criteria, indicators and standards that address the impacts. These terms are defined in the table below.

	<i>Definition</i>	<i>Non-aquaculture example</i>	<i>Aquaculture example</i>
<i>Impact</i>	The problem we want to minimize	Overweight	Water pollution
<i>Principle</i>	The guiding principle for addressing the impact	Maintain a healthy weight	Conserve and protect water resources
<i>Criteria</i>	The area to focus on to address the impact	Food consumption *	Effluents*

<i>Indicator</i>	What to measure in order to determine the extent of the impact	Calories	Nitrogen concentration in the effluent
<i>Standard</i>	The number and/or performance level that must be reached to determine if the impact is being minimized **	< 10 calories/pound of body weight/day	4 mg/L total nitrogen in effluent

**For this example, only one criteria is listed, even though there often are several criteria for each principle, as well as several indicators for each criteria.*

***A number is not necessary when an indicator cannot be measured (e.g., the indicator for the principle “obey the law,” which might be “documentation of compliance with national and local regulations”).*

Issue Areas of Salmon Aquaculture to Which the Standards Apply

The SAD establishes principles, criteria, indicators and measurable performance levels for responsible salmon aquaculture with regard to social and environmental issues. The seven areas of key potential negative impact that were identified within the Dialogue are: feed, escapes, nutrient loading and carrying capacity, benthic impacts and siting, disease and parasite transfer, chemical inputs and social impacts (i.e., labor and community impacts). It is recognized that there is overlap within the impact areas and the principles. The full suite of standards is intended to address the suite of potential negative impacts.

Animal welfare (i.e., farmed fish welfare and wildlife interactions, including treatment of and impacts on predators) has been raised by some stakeholders as an issue for the SAD to address. Wildlife interactions will be addressed under Principle 2. The SC has decided, however, not to comprehensively address farmed fish welfare in the standards document, as the SC believes that 1.) farmed fish welfare does not fall under the mandate of the SAD and was not part of the rationale for creating the SAD, 2.) the SC does not have appropriate expertise on the issue, 3.) other fish welfare standards and processes already exist, and 4.) there is potential to partner in the future with other certification programs that address farmed fish welfare. The SC expects that some aspects of farmed fish welfare will be addressed, indirectly, under the standards (e.g., through several environmental and fish health standards).

The SC also recognizes the importance of standards related to traceability and chain-of-custody. Those issues, however, will be addressed by another entity, as they are not the mandate of the SAD.

Range of Activities within Aquaculture to Which the Standards Apply

Aquaculture is the production of aquatic organisms. It involves the planning, development and operation of facilities, which in turn affect the inputs, production, processing and chain of custody components.

The SAD standards apply to the planning, development and operation of salmon aquaculture production systems. The focus of the standards is on production and the immediate inputs to production.

Biological and Geographic Scope to Which the Standards Apply

The salmon standards are applicable to species belonging to the genus *Salmo* and *Oncorhynchus*, and can be applied to all locations and scales of salmon aquaculture production systems.

Unit of Certification to Which the Standards Apply

The unit of certification is a farming site and the corresponding hatchery(ies) from which the fish farmed at the site originates. In undergoing assessment for certification, a company that owns multiple grow-out sites will be subject to compliance only at the particular site(s) and corresponding hatchery(ies) for which they choose to undergo certification. A farm must comply with all the standards in this document to be certified.

Implementation of the Standards

When finalized, the SAD standards will be handed off to a new organization, the Aquaculture Stewardship Council, which will be responsible for working with independent, accredited, third-party entities to certify farms that are in compliance with the standards. The ASC will also offer a Chain of Custody (CoC) assurance that tracks fish from a certified farm to the consumer.

In addition to their use by the ASC, the standards could potentially be incorporated into existing certification programs, government regulations and buyer and investment screens.

PROCESS FOR CREATING THE STANDARDS

General Considerations

The process of setting standards is critical, as it significantly affects the credibility, viability, practicality and acceptance of the standards. The process of creating the SAD standards has been – and will continue to be – multi-stakeholder, open to anybody to participate in and transparent. This is in line with the International Social and Environmental Accreditation and Labeling (ISEAL) Alliance’s “Code of Good Practice for Setting Social and Environmental Standards.” A goal of the SAD is to follow the ISEAL code.

Standards Setting Process

- In February 2004, under the leadership of WWF, the inaugural meeting of the SAD was held in Washington, DC. The primary goal of the meeting was to begin identifying which impacts to address through the standards. Several additional meetings were held in 2004 and 2005 to finalize the list of impacts.
- The process and format for the SAD was discussed at the June 2004 SAD meeting and formalized in a process document that was finalized in July 2008 (available at <http://www.worldwildlife.org/what/globalmarkets/aquaculture/WWFBinaryitem9675.pdf>).
- The scope and purpose of the Dialogue was discussed and finalized at the October 2004 SAD meeting. Roles, structure and governance were refined and then finalized at the November 2005 meeting.
- Technical Working Groups (TWGs) were created, starting in 2005, to help research issues related to salmon aquaculture. Members of the Dialogue were actively involved in choosing experts and developing a scope of work for the TWGs. Each of the seven TWGs was tasked with producing a "State of Information Report" that reviews the status of existing research related to the impact, identifies gaps or areas of disagreement in the research and suggests a process for addressing the gaps. The reports were presented at SAD meetings, beginning in December 2007.
- The SAD SC was created over the course of 2004 and 2005. The SC now includes the following people:

Name	Organization	Sector	Country
Petter Arnesen	Marine Harvest	Producer	Norway
Hernan Frigolett	Fundacion Terram	NGO	Chile
Rodrigo Infante	SalmonChile	Producer association	Chile
Andrea Kavanagh	Pew Environment Group	NGO	United States
Trygve Berg Lea	Skretting	Feed	Norway

		manufacturer	
Kjell Maroni	Norwegian Seafood Federation	Producer association	Norway
Jay Ritchlin	Coastal Alliance for Aquaculture Reform	NGO	Canada
Jose Villalon	World Wildlife Fund	NGO	United States
Mary Ellen Walling	Canadian Aquaculture Industry Alliance	Producer association	Canada

- Draft principles were presented and discussed at the January 2008 SAD meeting, then edited based on feedback from that meeting and further SC discussion. The draft principles were posted on the SAD website for public comment for a 60-day period which ended October 15, 2008, then discussed at the November 2008 Dialogue meeting. Principles were revised a second time based on feedback from the comment period and November meeting.
- Draft criteria were presented and discussed at the November 2008 SAD meeting, then edited based on feedback from that meeting and further SC discussion. Revised draft criteria were open for public comment via the website for a 30-day comment period that ended March 6, 2009. They were presented and discussed at the March 2009 SAD meeting. Feedback from the meeting and the public comment period were used by the SC to develop final draft criteria.
- From December 2009 to July 2010, the SC met regularly via phone, several times in person, and consulted with various experts from the TWGs in order to develop draft indicators and standards.
- Draft principles, criteria, indicators and standards were posted for a 60-day public comment period on August 3, 2010. A revised draft will be posted for a second, 30-day comment period. Feedback received during both comment periods will be used by the SC to revise and finalize the standards document. All general and specific comments received, as well as the SC's responses to the feedback, will be posted on the SAD website. Comments and responses will be sorted according to key issues, themes and frequency.
- Final standards will be given to a new entity, the Aquaculture Stewardship Council (ASC), which will be responsible for working with independent, third party entities to certify farms that are in compliance with the standards being created by participants of the Aquaculture Dialogues. The ASC is expected to be in operation in 2011.
- Throughout the process, WWF has, on behalf of the SC, written and disseminated press releases, and developed and updated the SAD website, to keep people informed of upcoming meetings and progress within the SAD.
- Throughout the process, the SC and SAD coordinator also have held outreach meetings (in person, or via phone or e-mail) with stakeholder groups identified in the outreach strategy. Additional outreach meetings will be held with key stakeholders during the two comment periods.

Continuous Improvement of the Salmon Aquaculture Dialogue Standards

As stated in the ISEAL "Code of Good Practices for Setting Social and Environmental Standards," "... standards shall be reviewed on a periodic basis for continued relevance and effectiveness in meeting their stated objectives and, if necessary, revised in a timely manner." It is implicit in the development of the SAD standards that the numerical values, or tolerance levels, will be raised or lowered over time to reflect new data, improved practices and new technology.

INFORMATION FOR THE READER

In the following pages, tables with indicators and their corresponding standards are included. Within each criterion, standards tables are followed by a rationale section that provides a brief overview of why the issues are important and how the proposed standards address them.

The “Additional Information” sections contain more detailed information on the process for arriving at the particular proposed indicators and standards. This information will not be included in the final standards document, or will be moved to an appendix, since it is included primarily to help inform the reader who wants to provide constructive comments on the draft standards. This section may contain, for example, explanations of indicators and standards that were considered but ultimately not included, as well as the rationale behind their exclusion.

When provided, the “Auditing Guidance” sections begin to explain how each standard should be interpreted by auditors or implemented at the farm level. A detailed auditing guidance document and auditor checklist will be developed after the standards are finalized. The information in these sections will be leveraged into those two documents.

Definitions are provided in footnotes.

Standards applicable to smolt production and grow-out are detailed in separate sections of the document, though there is some overlap of standards that are applicable to both.



This flag icon is used throughout the document to indicate a specific issue about which public feedback would be particularly helpful to the SC in formulating an effective standard. Public comment is, however, encouraged on any part of the document.

The standards in this document do not represent final agreement by the Salmon Aquaculture Dialogue Steering Committee. The document is presented as a working draft that will benefit from public input. The standards are open for public comment from August 3, 2010 through October 3, 2010. Comments can be submitted via the website at www.worldwildlife.org/salmondialogue. Feedback received during the public comment period will be posted online and used to develop revised draft standards. The Steering Committee expects to continue debating outstanding issues and developing alternatives based on public input, proactive outreach, and further research during the next several months. The Steering Committee expects to hold a public Dialogue meeting in October 2010, prior to releasing a second draft of the standards.

PRINCIPLES, CRITERIA, INDICATORS AND STANDARDS FOR GROW-OUT

This section of the document contains the first draft of the full suite of principles, criteria, indicators and standards for responsible salmon farming at saltwater grow-out sites.


PREAMBLE

The principles serve as a platform to minimize or eliminate the social and environmental impacts of salmon aquaculture while permitting the salmon farming industry to remain economically viable. These principles -- along with the corresponding criteria, indicators and standards -- are applicable at the farm level. Meeting the suite of principles to standards will require farms to have a high level of transparency and regular monitoring of a number of key indicators. Although the SAD is creating farm-level standards, they are intended to help protect and maintain ecosystem function and ecosystem services in salmon producing areas, with the recognition that aquaculture operations are not solely responsible for total ecosystem health. The standards are intended to be revisited and updated periodically (e.g., every three to five years) to ensure that the standards are based on the best available scientific knowledge and management practices and to encourage continuous improvement.

PRINCIPLE 1: COMPLY WITH ALL APPLICABLE INTERNATIONAL AND NATIONAL LAWS AND LOCAL REGULATIONS

Principle 1 is intended to ensure that all farms aiming to be certified against the SAD standards meet their legal obligations as a baseline requirement. Adhering to the law will ensure that producers meet the basic environmental and social requirements and the minimal structures, such as legitimate land tenure rights, on which the effectiveness of the standards will stand.

Criterion 1.1: Compliance with all applicable local, national and international legal requirements and regulations

INDICATOR	STANDARD
1.1.1 Presence of documents demonstrating compliance with local and national authorities on land and water use	Yes
1.1.2 Presence of documents demonstrating compliance with all tax laws	Yes
1.1.3 Presence of documents demonstrating compliance with all labor laws and regulations	Yes
1.1.4 Presence of documents demonstrating compliance with regulations and permits concerning water quality impacts	Yes
1.1.5 Presence of documents demonstrating compliance with importing laws of countries ¹ that have received products from the farm within the past 12 months	Yes 

Rationale

Salmon aquaculture operations must, at a minimum, adhere to the national and local laws of the regions where production is taking place. Farm operations that, intentionally or unintentionally, break the law violate a fundamental benchmark of performance for certified farms. It is important that aquaculture operations demonstrate a pattern of legal and responsible behavior, including the implementation of corrective actions for any legal violations. The SAD standards go beyond those required by law in many circumstances. They are not, however, intended to contradict them. Laws that compel a farmer to take certain action take precedence over voluntary standards. The standards under Principle 1 are a means to reinforce and complement the legal framework.

¹ Some countries have specific importing laws that, for example, prohibit the use of specific chemicals in the production of fish sold into that country.

Additional information

The primary focus of this principle is national and local laws and regulations. Although international legal requirements are agreed to be important, the practicality of including international conventions in these standards is limited because of ratification and other issues. Some specific international legal issues are addressed in other sections of the standard, such as Principle 6, which refers to International Labor Organization conventions.

Despite concerns about equivalent status being granted to products grown in countries with varying levels of legal requirements, it is outside the scope of the SAD to address differences in national legislation, providing that legislation is complied with.

🚩 1.1.5: The SC is discussing ways to clarify and ensure auditability of 1.1.5. Concerns have been raised that it may be difficult, especially for smaller scale producers, to collect the needed data from their exporters and to prove compliance with all importing regulations in all potential countries. One option may be to focus the standard to relate specifically to importing laws related to chemical use, as that issue is a primary driver of the development of this standard. Another option may be to require farms to proactively develop a list of countries where their product cannot be legally exported due to import restrictions. Some SC members are concerned that the standard as written inappropriately extends the scope to include a future value chain over which the producer may not have control.

Auditing guidance

In order to ensure compliance with these standards, auditors will need to review a range of documentation and relevant correspondence related to farm siting and operation. It is probable that some of the information will need to be generated by the headquarters of the company owning the operation, while other information will relate specifically to the site. The final standards document and associated auditing guidelines should include a list of the required documentation. This documentation and auditing activities may include and are not restricted to:

- For 1.1.1: copies of the applicable land and water use laws, original lease agreements or land titles, permits from government agencies, inspection for compliance with national and local laws and regulations, and documents outlining allowable activities in or near national preservation areas (e.g., parks, limited use protected areas)
- For 1.1.2: proof of compliance with tax payments to appropriate authorities and copies of tax laws for the jurisdiction(s) in which the company is operating
- For 1.1.3: national labor codes and laws applicable to the farm and inspection of the facility for compliance
- For 1.1.4: discharge laws and applicable permits for operation, as well as records of monitoring and compliance with discharge regulations
- Review of any violations and associated corrective actions taken over the five-year period prior to certification to demonstrate a pattern of legal and responsible behavior. This may include review of lists developed by relevant regulatory authorities of companies and operations with infringements or violations or official communications by the company with government.
- Review to ensure that if legislation is more demanding than the Dialogue standards, relevant legislation is met

PRINCIPLE 2: CONSERVE NATURAL HABITAT, LOCAL BIODIVERSITY AND ECOSYSTEM FUNCTION

Principle 2 is intended to address potential impacts from salmon farms on natural habitat, local biodiversity and ecosystem function. Specifically, the key impact areas of benthic impacts, siting, effects of chemical inputs and effects of nutrient loading are addressed within this principle.

Criterion 2.1: Benthic biodiversity and benthic effects

INDICATOR	STANDARD
2.1.1 Redox potential or sulphide levels in sediment outside of the Allowable Zone of Effect (AZE) ²	Redox potential > 0 millivolts (mV) Sulphide ≤ 1,500 microMoles / l
2.1.2 AZTI Marine Biotic Index (AMBI ³) in sediment outside of the AZE, following the sampling methodology outlined in Appendix I subsection 1	AMBI score ≤ 3.3
2.1.3 Number of macrofaunal taxa in the sediment within the AZE, following the sampling methodology outlined in Appendix I subsection 1	≥ 2 highly abundant taxa

Rationale

This suite of indicators provides multiple layers of security related to benthic impacts, using a chemical proxy for health combined with biodiversity measurements in two locations. Technical experts suggest the chemical proxy of redox potential and sulphide levels, which are good chemical indicators for benthic health. Given that both methods are valid, audited farms can choose their preference for one or the other. Standards have been set for both.

When considering benthic effects, experts recommended measuring effects below the cages and away from the cages, within and outside of the AZE. Though an AZE is difficult to identify as a constant, experts discuss this in terms of 25 meters to 125 meters depending on a range of factors, including currents. In an effort to take a precautionary approach to permissible zone of benthic impact, the SAD standards define the AZE as a distance of 30 meters from cages. Similarly, as a precautionary approach, these standards are applicable regardless of the depth of the site.

Potential negative impacts on benthic biodiversity are addressed in the standard through the incorporation of an annual AMBI analysis and minimum score at multiple monitoring stations outside of the AZE, including a reference site (see Appendix I subsection 1). Within the AZE, a demonstration that two or more benthic worm species, or macrofauna, are present is required to ensure impacts fall within an acceptable level.

² Allowable Zone of Effect (AZE) is defined under this standard as 30 meters

³ <http://www.azti.es/en/ambi-azti-marine-biotic-index.html>

Concerns have been raised that access to AMBI analysis and the practicality of implementation of AMBI may vary across producing regions. Because of this, the SC is considering identifying other relevant tests and their equivalent thresholds to ascertain benthic biodiversity impacts. Other tests, such as the Shannon-Weiner index or Hurlbert’s index, might be considered and the SC welcomes comments on these or other options.

Additional information

Redox seems to be more prevalent globally than sulphide and has less risk of false positives, which can occur for sulphide due to poor electrode maintenance. Producers may wish to consider this possibility when considering which measurement to use. Through the consultation of technical experts and review of Hargrave, et al.⁴ (2008), a proposal of 1,500 mM sulphide levels and equivalent Redox Potential of >0 mV was proposed as ensuring acceptable and transitory benthic conditions.

The AMBI is a tool to establish the environmental quality of soft-bottom benthos. AMBI scores range from 0, or undisturbed, to 7, which correlates to extremely disturbed or azoic. Experts recommended setting the AMBI score to be less than or equal to 3.3. An AMBI score less than or equal to 3.3 is equivalent to good to high environmental status, while scores greater than 3.3 relate to moderate or worse environmental status and a benthic quality of transitional to pollution, polluted or worse⁵.

Criterion 2.2 Water quality in and near the site of operation

INDICATOR	STANDARD
2.2.1 Weekly average percent saturation ⁶ of dissolved oxygen (DO) ⁷ on farm	≥60%

⁴ Hargrave, B.T., Holmer, M. and Newcombe, C.P. 2008. Towards a classification of organic enrichment in marine sediments based on biogeochemical indicators. *Marine Pollution Bulletin* 56, 810-824.

⁵ Borja, A., Franco, J., Perez, V., 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. *Mar. Poll. Bull.* 40, 1100–1114.

Muxika, I., Borja, A., and Bonne, W. 2005. The suitability of the marine biotic index (AMBI) to new impact sources along European coasts. *Ecological Indicators* 5, 19–31.

Muniz, P. et al. 2005. Testing the applicability of a Marine Biotic Index (AMBI) to assessing the ecological quality of soft-bottom benthic communities, in the South America Atlantic region. *Marine Pollution Bulletin* 50, 624–637.

⁶ Percent saturation: Percent saturation is the amount of oxygen dissolved in the water sample compared to the maximum amount that could be present at the same temperature and salinity

⁷ Averaged weekly from two daily measurements (proposed at 6 am and 3 pm)

2.2.2 Maximum percentage of weekly samples from 2.2.1 that fall under 1.85 mg/liter DO	5%
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Rationale

Water quality is essential for the health of farmed salmon and wild species surrounding a farm. One component of water quality, DO, is particularly critical for the survival and good performance of farmed salmon. As a result, most farms regularly measure DO. DO levels (in mg/l) naturally fluctuate in the environment. This is due to a range of factors, including temperature, time of day and upwelling of oxygen-poor waters from deep in the ocean. Low DO levels can also be a sign of excessive nutrient loading. DO provides a useful overall proxy for a water body’s ability to support healthy biodiversity and supplements the benthic indicators that will also pick up excessive nutrient loading.

Salmon ideally need a level of dissolved oxygen over 5 mg/lit to avoid any possible stress, although they are able to live under lower oxygen concentrations, particularly if only for short periods of time. Under routine production, the average minimum percent saturation of DO in the water column should be above 60%. Measuring DO as a percent saturation takes into account salinity and temperature at the farm site. Compliance with the proposed draft SAD standards will limit the number of low DO readings in the water column below 1.85 mg/lit to less than 5% incidence rate, which will allow for periodic physical phenomena, such as upwelling.

Criterion 2.3: Nutrient release from production

INDICATOR	STANDARD
2.3.1 Percentage of fines in the feed at point of entry to the farm (measured according to methodology in Appendix I subsection 2)	<1% by weight of the feed

Rationale

The release of nutrients into the environment from salmon farms was identified by SAD participants as a key impact of production. The impact is addressed throughout the standards with a range of water quality and benthic performance metrics. Standard 2.3.1 complements these other standards by addressing the direct release of uneaten feed in the form of fines into the environment. By setting a maximum percentage of fines in the feed, it addresses the efficient and proper transport, storage and physical delivery of feed pellets to the net pens. Poor performance in any of the above phases of feed handling will result in a higher percentage of fines (fine particles of feed) and potentially increased environmental impacts, due to an increase in suspended organic particles and nutrients released into the environment.

Criterion 2.4: Interaction with critical or sensitive habitats and species

INDICATOR	STANDARD
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<p>2.4.1 Clear, substantive documentation on a) proximity to critical, sensitive or protected habitats and species, b) the potential impacts the farm might have on those habitats or species, and c) a program underway to eliminate or minimize any identified impacts the farm might have</p>	<p>Yes</p>
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Rationale

The intent of the standard(s) under criterion 2.4 is to minimize the effects of a salmon farm on critical or sensitive habitats and species. The habitats and species to consider include marine protected areas or national parks, established migratory routes for marine mammals, threatened or endangered species, the habitat needed for endangered and threatened species to recover, eelgrass beds and High Conservation Value Areas (where defined).

Indicator 2.4.1 is designed to ensure a farm is aware of any nearby critical, sensitive or protected areas, understands the impacts it might have on those areas, and has a functioning plan in place to address those potential impacts.

Additional information

The distance from critical, sensitive or protected habitats and species was also considered as an additional standard to build on 2.4.1. However, distance needed may vary by species or habitat that a farm is trying to protect. Requiring a minimum distance away from sensitive areas is difficult, as the actual risks will vary so greatly depending on the habitat and situation. Unless the standards clearly define a subset of particular habitats or species to which the standards are applicable and set a distance based on the potential for salmon farming to affect those particular types of habitats or species, they would not necessarily be meaningful or effective as standards.

🚩 What standard(s) might be added to complement 2.4.1 and minimize potential effects of farms on critical, sensitive or protected habitats and species? Are there particular species or habitats for which we should develop a standard related to minimum distance of farms from those species or habitats?

Criterion 2.5: Interaction with wildlife, including predators

INDICATOR	STANDARD
<p>2.5.1 Number of days where acoustic deterrent devices were used</p>	<p>0, within two years of the date of publication of the SAD standard</p>
<p>2.5.2 Prior to the achievement of 2.5.1, evidence that if acoustic deterrent devices are in use, the farm is developing and implementing a plan to phase out their use</p>	<p>Yes</p>

2.5.3 Number of marine mammals and birds killed through the use of lethal action⁸



Rationale

Scientific literature⁹ about the use of acoustic deterrent devices (ADDs), also known as acoustic harassment devices, to deter predators from marine aquaculture facilities show three main conclusions. First, ADDS have been demonstrated to damage the hearing capability of marine mammals (target and non-target species). Second, they have been demonstrated to force a change in the natural feeding or breeding behavior of some marine mammals. And, third, over time and with regular use, ADDs begin to act as an incentive that actually attracts rather than deters the target species (e.g., seals) from the aquaculture facilities.

While the devices are effective in the beginning in deterring marine mammals and other predators, they quickly begin to lose their effectiveness and, in almost all cases, become completely ineffective within two years. The standard, therefore, encourages farms not to use ADDs. If they are in use, a plan must be in place to phase out their use within two years of the publication of the SAD standards. During this time, the standard encourages continued research into development of new devices that might be more effective deterrents and have significantly less impact on marine mammals. In addition, the use of lower impact methods, such as predator nets or other systems that minimize the interaction between predators and the cultured fish, would be encouraged.

Additional information

The SC is still considering whether there are additional exceptional circumstances that would allow for killing of either marine mammals or birds.

Criterion 2.6: Cumulative impacts on biodiversity

INDICATOR

STANDARD

⁸ Lethal action: Action taken to deliberately kill an animal, including marine mammals and birds. Accidental entanglement is not considered lethal action. Exceptions can be made for actions taken to avoid personal injury.

⁹ Fjalling, A, Wahlberg, M and Westerberg H, 2006 Acoustic harassment devices reduce seal interaction in the Baltic Salmon-trap, net fishery, ICES Journal of Marine Science: Volume 63, Number 9 pp. 1751-1758.

B.C. Government, 1997, The environmental risks of salmon aquaculture, pp. 35-37


Cox, TM, Read A.J., Solow, A, Tregenza, N, 2001, Will harbor porpoises (*Phocoena phocoena*) habituate to pingers, J. Cetacean Res. Manage 3(1) 81-86

2.6.1 Presence or absence of selected sensitive or sentinel¹⁰ species



Rationale

Biodiversity and cumulative impacts are addressed across the document, either directly through biodiversity measurements or indirectly through proxy measurements and rules around predator control and use of antibiotics and treatments. The intent of criterion 2.6 is to incorporate an additional and overarching way to help protect biodiversity under the SAD standards. One of the challenges of this criterion is that it often is difficult to distinguish among the effects of salmon farming and the effects of other activities on the marine environment.

 In practice, the SC has found it very challenging to develop standards that accomplish the intended goal of this criterion. Indicator 2.6.1 attempts to provide an additional layer of security by identifying a sentinel species that would be a reference point for the overall health of the ecosystem. In principle, there is agreement that it's a good idea. In practice, it is very difficult to identify an appropriate sentinel species in all salmon-producing regions. In addition, there are concerns that this standard may hold farms accountable for population declines that have nothing to do with the farm. Finally, it would likely require data gathering that would exceed a single farm's ability. It requires further discussion to determine if it's viable. One option would be to identify within the SAD a select group of regional sentinel species for farms to include in the risk assessments that are being developed under standard 2.4.1. The SC recognizes a need to further explore this option and brainstorm additional options for how to address this issue within the standards. Suggestions for how to do so are appreciated.


¹⁰ Sentinel species, also referred to as indicator species, are species that define a trait or characteristic of a specific environment or ecoregion. Typically, they are sensitive species that can be monitored to serve as an early warning system to indicate environmental change.




PRINCIPLE 3: PROTECT THE HEALTH AND GENETIC INTEGRITY OF WILD POPULATIONS

The primary aim of Principle 3, in combination with Principle 5, is to ensure salmon farms do not harm the health of wild fish populations. This principle addresses impacts associated with disease and parasites, escapes and siting.

Criterion 3.1 Introduced or amplified parasites and pathogens

INDICATOR	STANDARD
<p>3.1.1 Participation in an effective area-based scheme for managing disease and resistance to treatments. This includes production levels, coordinated application of treatments, rotation of different treatments, open communication about treatment, monitoring schemes, stocking and transport. Detailed requirements are in Appendix II.</p>	<p>Yes</p>
<p>3.1.2 An assessment of key regional cumulative impacts of the farm and its neighbors, including an analysis of the appropriate density and infection pressure risk on wild populations. Specific areas that must be covered are listed in Appendix III.</p>	<p>Yes</p>
<p>3.1.3 A demonstrated commitment to collaborate with NGOs, academics and governments on areas of mutually agreed research to measure possible impacts on wild stocks. Farms located in areas of wild salmonids¹¹ must focus this research on measuring sea lice levels on wild juveniles and understanding the link between sea lice levels on farms and in the wild.</p>	<p>Yes</p>
<p>3.1.4 Maximum average sea lice levels on all farms in the area-based management scheme.</p>	<p>TBD </p>

¹¹  Areas of wild salmonids are defined as areas that are within a certain distance of a wild salmonid migration route (or for coastal trout, an equivalent). The appropriate distance is still under discussion. One option is a distance such as 75 kilometers (as suggested by Krkosek et al in the Proceedings of the Royal Society in 2005), which would imply that much of the salmon production in the northern hemisphere is covered in this definition.

<i>The following indicators would only apply to farms located in areas of wild salmonids that cannot demonstrate total containment¹² or separation of parasite and disease vectors from the wild environment</i>	
3.1.5 Timing of wild salmonid outmigration and juvenile periods is well established and monitored. ¹³	Yes
3.1.6 Measure lice levels on wild juveniles during outmigration, as part of an area-based management plan, and in partnership with NGOs, academics and governments, as appropriate. (Note: this would be the way for these farms to meet 3.1.3.)	Yes
3.1.7 Maximum average sea lice levels on all farms in the area-based management plan during juvenile outmigration (or equivalent for coastal salmonids).	Maximum 0.5 mature sea lice per fish or 3 total sea lice. 
3.1.8 In areas of coastal trout, maximum average sea lice levels on all farms in the area-based plan during non-juvenile periods.	TBD 
3.1.9 Period of demonstrated compliance with standards in 3.1 prior to initial certification.	Under discussion 

Rationale

Area-based management forms the core of the SAD standards, as it is a means to ensure farms don't harm the health of wild populations through the transmission or amplification of disease. This approach reflects the fact that there are cumulative impacts from a group of farms in an area that can become harmful even when an individual farm is operating its own operation in a responsible way. In addition, coordinated management of diseases and biosecurity measures can dramatically improve results and reduce impacts on ecosystems. This coordinated approach is particularly important when managing diseases, such as sea lice. Lack of coordination can lead to negative outcomes, such as resistance to treatments. The benefits of this coordination outweigh the additional burden the approach may place on individual farms to help create these area-based schemes in regions where they don't already exist.

The impact assessment intends to ensure a credible third party has analyzed the key cumulative impacts of the farm and its neighbors. The specific components of the assessment described in Appendix III represent the basic information that a farm should know about its impact on the surrounding environment. The assessment should

¹² The SC is still developing a clear definition of "containment." The intent is to cover farms that are completely separated from the wild environment.

¹³ The SC is still discussing what information is needed to demonstrate compliance with this standard.

analyze the infection pressure risk presented by the farm, by looking at the farm's proximity to wild populations, particularly migrating and coastal wild salmonids, and recommend an appropriate density for farmed fish based on that proximity and the specific attributes of the ecosystem. The farm must demonstrate that it is complying with the recommendations in the study.

An impact assessment conducted as part of the farm's initial licensing would be sufficient to comply with 3.1.2, as long as the study covered the areas described in Appendix III. Any gaps in the original study would need to be supplemented by new assessment work. All assessments must be conducted by a credible third party accredited by the relevant national regulatory body to perform this kind of analysis.

The commitment to research required under 3.1.3 intends to ensure farms are working with researchers and regulators to address the many gaps in understanding around a farm's interaction with wild populations. A demonstrated commitment means that the farm is participating in joint research efforts. The SAD believes that one of the most critical research gaps is around the interaction of farms and wild populations in the transmission and amplification of sea lice. This standard aims to develop a global body of research that measures sea lice levels on wild salmonid juveniles, and correlates that data with on-farm sea lice levels across producers in an area management plan. The SAD expects that researchers will need to become more consistent in their methodology for testing for sea lice in the wild.

Farms located within areas of wild salmonids require additional precautionary measures, given concerns over the farm's impact on wild salmon and coastal trout. As a baseline requirement, farms must demonstrate that the timing and location of salmonid migration and spawning in the area is known and well established. In addition, all farms in the area-based scheme must keep their average sea lice levels to a precautionary low level, particularly during periods when wild population are most vulnerable, such as juvenile outmigration.

The focus on sea lice in this criterion reflects the challenge that sea lice represents for the industry, as well as the fact that sea lice can be seen as a proxy for overall health of a farm and the risks it presents to wild populations.

Additional information

Several components of the standards under 3.1 are still under development.

🚩 3.1.4, 3.1.7, 3.1.8: The SC is considering how to set global maximum sea lice levels that are meaningful in different regions and jurisdictions. The following concepts are guiding the deliberation.

- There is a trade-off between pressing for very low sea lice levels and the danger of over-treatment and development of resistance
- Juvenile outmigration is a particularly sensitive moment for wild salmon populations, and sea lice levels during that period should reflect a precautionary low level
- Coastal trout are susceptible to sea lice because they potentially remain in contact with sea lice from farms throughout the year
- The transmission of sea lice from farmed fish to wild populations, and visa versa, is still poorly understood
- Maximum farm level limits should be an average of sea lice levels on all farms in the area-based plan, since that is the infection pressure that wild populations will experience

Given these concepts, the SC is considering the following, as detailed in the indicators above:

- A global sea lice level for all farms seeking certification that may be as low as 0.5 motile female sea lice per fish
- A sea lice level during juvenile outmigration that is 0.5 motile female sea lice or lower

- A feedback loop from testing of sea lice on wild juveniles to ensure the farm level limits are appropriate
- A year-round sea lice level for areas of coastal trout that is yet to be determined


The suggested levels reflect experience and regulation in Norway and other countries. There is concern that setting global sea lice levels is a blunt instrument for this standard because it doesn't adequately take into account the regional and ecosystem difference of the areas where salmon are farmed. The SC welcomes feedback on how to combine the simplicity and consistency of a global standard with the varied ecosystem realities of different salmon-growing regions.

Additional ideas for standards that have been raised for consideration to minimize potential disease impacts include:

- Requiring that the infection pressure risk calculated in the cumulative impact assessment be maintained at background levels during sensitive periods for resident wild salmonids
- Prohibiting the certification of farms sited in areas of that pose the greatest risk to wild salmonids, such as areas where juveniles are most vulnerable, or areas in proximity to stocks of special concern (on national at risk lists or the IUCN Red List of Threatened Species).

3.1.9 The SC seeks input on the idea of a demonstration period to ensure that a farm is performing and fully implementing area-based management, wild juvenile monitoring and other aspects of 3.1 prior to certification. As is the case with all standards in this document, the standards in 3.1 require demonstrated compliance with the performance measures on an annual basis. The SC is considering for what length of time prior to certification the farm would need to comply with these standards. One option would be an entire production cycle. This approach seeks to address concerns that the link between farm management and impact on wild populations isn't fully understood. Given this uncertainty, farms would need to demonstrate that this management approach is having the desired effect. On the other hand, these standards do not want to place unreasonable burdens on farms that seek certification. The SC is considering alternatives that would address these concerns.

Criterion 3.2 Introduction of non-native species

INDICATOR	STANDARD
<p>3.2.1 If a non-indigenous species is being farmed, evidence and documentation that the species is already widely used in commercial production locally by the standards release date;</p> <p>AND, <u>one</u> of the following is met:</p> <p>A) There is no evidence of establishment or impact in adjacent ecosystems</p> <p>B) The species has been approved for aquaculture use by a process based on ICES code of practice on the introductions and transfers of marine organisms or comparable protocol</p>	<p>Yes </p>

3.2.2 Use of non-native species for sea lice control or on-farm management purposes	None
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Rationale

Accidental or intentional introductions of non-native species are significant global environmental problems.¹⁴ Introduced species also can impact society and the economy, according to the United Nations Food and Agriculture Organization (FAO, 2005). Aquaculture is considered to be one of the major pathways for introducing non-native aquatic plants and animals that may become harmful invasive species. Standard 3.2.1 reflects the FAO guideline that permits the culture of non-native species only when they pose an acceptable level of risk to biodiversity.

The use of alternatives to chemical treatments for farm management, such as the use of cleanerfish for sea lice control, is permitted and encouraged under the SAD standards. However, any wrasse, cleanerfish or other species used for management during production must be native species in order to prevent introduction of new species to an area.

Additional information

There is a question around how 3.2.1 will be defined and audited, in particular related to evidence required to demonstrate that there is no establishment or impact on adjacent ecosystems. There is desire by part of the SC to focus on establishment rather than impact. There also is some desire to further explore the meaning of the ICES code and whether it is a sufficiently strong protocol to protect wild species.

Criterion 3.3 Introduction of transgenic species

INDICATOR	STANDARD
3.3. Use of transgenic ¹⁵ salmon by the farm	None


Rationale

Transgenic fish are not permitted under this standard because of concerns about their unknown impact on wild populations.

¹⁴ Leung, K.M.Y. and Dudgeon, D. 2008. Ecological risk assessment and management of exotic organisms associated with aquaculture activities. In M.G. Bondad-Reantaso, J.R. Arthur and R.P. Subasinghe (eds). Understanding and applying risk analysis in aquaculture. FAO Fisheries and Aquaculture Technical Paper. No. 519. Rome, FAO. pp. 67–100.

¹⁵ Transgenic: Containing genes altered by insertion of DNA from an unrelated organism. Taking genes from one species and inserting them into another species to get that trait expressed in the offspring. (http://www.csrees.usda.gov/nea/biotech/res/biotechnology_res_glossary.html). This definition does not include sterile or all female fish.


Criterion 3.4 Escapes

INDICATOR	STANDARD
3.4.1 Percentage of fish loss during a production cycle (pre-smolt vaccination to harvest) that is unexplained by mortalities or other known causes	No more than 0.1% more than the documented accuracy of the counting machines or counting method used 
3.4.2 Maximum number of escapes episodes (defined as involving 200 or more fish), with the exception of episodes that are clearly documented as being out of the farm's control ¹⁶	0
3.4.3 Evidence of compliance with national regulations and technical standards aimed at reducing the risk of escapes	Yes
3.4.4 Evidence of escape prevention planning, including net strength testing, net traceability, system robustness, predator management, record keeping and reporting of risk events (e.g., holes, infrastructure issues, handling errors, reporting and follow up of escape events)	Yes

Rationale

Escaped farmed salmon have the potential to disrupt ecosystems and alter the overall pool of genetic diversity through competition with wild fish and interbreeding with local wild stocks of the same population. The standards in this criterion aim to minimize escapes to near zero. Escapes can occur in large events, which are immediately noticeable at a farm, or through slower, lower levels of leakage of fish. These standards ensure certified farms have had no significant escape events. The standard around maximum unexplained loss of salmon addresses leakage of fish. Counting the number of escapes is a challenge on farms, due to the margin-of-error of fish counting machines. These standards limit the amount of unexplained loss to essentially the stated counting error on the farm's counting machines or counting technique. The calculation of unexplained loss focuses on the two moments when farms have the most accurate counts: pre-smolt vaccines and harvest. In addition, they require farms to observe local norms around escapes management, as well as best management practices to prevent escapes.

Additional information

 The SC is still exploring whether 3.4.1 is a workable standard that incorporates accountability for escapes with necessary margin of error due to counting technology.

¹⁶ The farmer must demonstrate that there was no reasonable way to predict the events that caused the episode. Extreme weather (e.g., 100-year storms) or accidents caused by farms located near high-traffic waterways are not intended to be covered under this exception.

🚩 The SC is considering adding an additional standard to further address the issue interbreeding and welcomes input on whether such a standard is needed or what it might look like.

PRINCIPLE 4: USE RESOURCES IN AN ENVIRONMENTALLY EFFICIENT AND RESPONSIBLE MANNER

Principle 4 is intended to address negative impacts that stem from resource use, including feed and non-therapeutic chemical inputs.


Criterion 4.1 Traceability of raw materials in feed

INDICATOR	STANDARD
4.1.1 Presence and evidence of traceability of all raw feed ingredients with regard to country of origin, as demonstrated by the feed producer	Yes

Rationale

Raw material traceability is fundamental to many of the SAD standards and, therefore, is required under this standard. This standard will make raw material sourcing more transparent. It must be demonstrated at the feed manufacturer or feed producer level.

Criterion 4.2 Use of wild fish for feed

INDICATOR	STANDARD
4.2.1 Fishmeal Forage Fish Dependency Ratio (FFDR _m) for grow-out (calculated using formulas in Appendix IV, subsection 1)	<1.31 
4.2.2 Fish oil Forage Fish Dependency Ratio (FFDR _o) for grow-out (calculated using formulas in Appendix IV, subsection 1)	<2.85
4.2.3 Fish Protein Index (FPI) for grow-out (calculated using formulas in Appendix IV, subsection 2)	80% prior to January 2014 and >100% as of January 1, 2014

Rationale

Most wild small pelagic fish resources are fished at capacity or overfished. These fish, sometimes referred to as forage fish, are eaten by humans and also are reduced into fishmeal and fish oil for use in animal and aquaculture feed. Demand for these resources is increasing as the aquaculture industry expands and as forage fish are increasingly consumed by humans or by other industries. There is concern that higher demand could lead to the overfishing – and collapse – of small forage fish stocks.

Wild small pelagic fish play a critical role in the ecosystem and the marine food chain. Some conservation groups and scientists are concerned that even fisheries that are not classified as overfished from a population perspective are, or could be, overfished from an ecological perspective.

The salmon aquaculture industry has significantly reduced the amount of forage fish in salmon feeds during the past two decades. The Forage Fish Dependency Ratios (FFDR) contained in these standards aim to support the trend toward lower inclusion rates and increasingly efficient use of marine resources, which are expected to continue. The ratios, one for fishmeal and another for fish oil, calculate the dependency on forage fisheries through an assessment of the quantity of live fish from small pelagic fisheries required to produce the amount of fishmeal or fish oil needed to produce a unit of farmed salmon.

Producers will be able to improve their FFDR by using a greater percentage of fishmeal and fish oil from trimmings and offal, using other sources of meal and oil (e.g., vegetables) and improving their feeding efficiency. The standards reflect a level that is achievable today by about 20% of the salmon industry.

The ratios complement the standards described in criterion 4.3, which will move farms toward using feed with marine ingredients from fisheries certified as responsibly managed. Obtaining marine feed ingredients from certified sources will address many of the same issues that FFDR seeks to address. The FFDR standards provide additional assurance around the responsible use of marine ingredients by salmon farmers, especially given the difficulty to ensure the effectiveness of certification schemes for pelagic fisheries.

The FPI adds another layer of assurance by promoting the efficient conversion of forage fish protein into farm salmon protein. The index compares the amount of protein in harvested farmed salmon to the amount of forage fish protein used in feed. Trimmings and offal are excluded, as in the FFDR calculations. If the index is 1 (or 100%), the protein in the farmed fish is equal to the protein in forage fish ingredients. The main variables that will affect the index are the feed efficiency on the farm and the amount of trimmings and offal.

Additional information

The FFDR and FPI are proposed to be calculated during the grow-out phase of salmon production. Salmon is normally transferred to sea at a size of 50 – 200 grams. A normal slaughter-weight, live fish, will weigh approximately 5,000 grams. This means that the freshwater period represents only about 1 to 4% of the total life cycle. In order to do a correct calculation of FFDR, one needs a detailed inventory of the feed used and an accurate calculation of economic FCR. This information is readily available at the grow-out (sea water) site. If one also has to provide information from the freshwater site, it makes it more complicated to gather necessary information. This information adds little value in terms of ecological gain, as it only represents 1 to 4% of the life cycle. As a result, only a fraction of the total feed is used during the freshwater production phase. Some farmers, especially small-scale farmers, will buy smolt from a third party producer. This can also make it more complicated to get access to the information needed.

For most of the standards, the SAD has tried to identify best practices in the industry and incorporate these best practices into the standards. When identifying the present standards linked to FFDR of fishmeal and fish oil, the SAD did a survey of the variables that go into the calculation and established the current variation in the industry. Using recognized statistical methods the SAD then identified the variation of FFDR for fishmeal and fish oil in the industry. Using this data, it was also possible to determine an FFDR that was consistent with a level achievable by approximately 20% of the industry (i.e., the better performers on this issue).

The SC decided to use the term FFDR, which is referred to in some of the other Aquaculture Dialogues as Forage Fish Efficiency Ratio (FFER). For the SC, the term “dependency” more accurately reflects the meaning of this

indicator, as it refers to how dependent salmon production is on the catch of forage fish needed to produce the fishmeal and oil used in feed.

The SC continues to debate several issues related to FFDR:

🚩 One question is whether to exclude from the FFDR calculation all fishmeal and oil from certified sources (i.e., the certified sources described in 4.3.1). Some SC members consider that FFDR becomes redundant when marine ingredients come from certified sources. Other SC members are less confident that certified sources will, indeed, be managed in a way that ensures sustainability of the stocks from an ecosystem perspective, given the fundamental role that these fisheries play in the aquatic food chain and scientific uncertainty around effects of removal of these fish. Due to these concerns, these SC members see FFDR, with all forage fish included, as an important added layer of assurance.

🚩 Another question relates to the effect that reducing the use of forage fish in salmon aquaculture is likely to have. SC members recognize the importance of forage fish being available for direct human consumption. Some SC members seek to restrict certified farms’ use of marine ingredients through FFDR in order to help reduce pressure on forage fisheries and provide greater opportunity for human consumption. Other SC members anticipate that unilateral action by aquaculture to reduce forage fish use won’t promote human consumption, given the demand for fishmeal and oil from other, less efficient users of the resource (e.g., pig and poultry production).

Criterion 4.3 Source of marine raw materials

INDICATOR	STANDARD
<p>4.3.1 Commitment to source feed containing >90% fishmeal or fish oil originating from fisheries¹⁷ certified under an ISEAL member’s accredited sustainability certification scheme. This must be done as the product becomes available and within 5 years of the publication of the SAD standards.</p>	<p>Yes</p>
<p>4.3.2 Prior to achieving 4.3.1, the FishSource score¹⁸ for the fishery(ies) from which a minimum of 80%¹⁹ of the fishmeal or fish oil is derived. (See Appendix IV, subsection 3 for explanation of FishSource scoring.)</p>	<p>TBD 🚩</p>
<p>4.3.3 Prior to achieving 4.3.1, demonstration of chain of custody and traceability for fisheries products in feed</p>	<p>Yes</p>

¹⁷ This standard applies to fishmeal and oil from forage fisheries and not to by-products or trimmings used in feed

¹⁸ Or equivalent score using the same methodology

¹⁹ By volume

<p>through an ISEAL accredited or ISO 65 compliant certification scheme that also incorporates the FAO²⁰ Code of Conduct for Responsible Fisheries.</p>	
<p>4.3.4 Feed containing fishmeal and/or fish oil originating from by-products²¹ or trimmings from fish species which are categorized as vulnerable, endangered or critically endangered, according to the IUCN Red List of Threatened Species.²²</p>	<p>None</p>

Rationale

The sourcing of fishmeal and fish oil was a serious concern for SAD participants. This is largely because wild fish are extracted from the oceans to be converted to fishmeal and fish oil for farmed salmon, and certain marine forage species are in question with respect to the health of their stocks. These indicators strive to ensure marine-based feed ingredients come from sustainable sources in the short- and long-term. The final development of standards for this issue must await completion of the review and potential certification of the sustainability of pelagic forage fish stocks targeted for fishmeal production by a widely recognized authority such as the Marine Stewardship Council or another member of the ISEAL Alliance. Until such product is available, producers must commit to sourcing feed that is independently certified within five years of the publication of the SAD standard or as product becomes available. The SAD will encourage the ASC to update the standard so that it reflects this requirement for the ISEAL-accredited certification of sustainably-sourced fishmeal and oil in feed. Producers and feed manufacturers should be aware of this intent and begin to plan accordingly.

Many of the stakeholders in the SAD are, nevertheless, anxious to include sustainability criteria for pelagic fisheries in the standards. Therefore, in the interim, standards under this criteria restrict fisheries currently known to have the poorest status from being used for fishmeal and fish oil and places traceability requirements on the fishmeal and fish oil used in the feed. The former is done through a requirement under standard 4.3.2 for a majority percentage of the fishmeal and fish oil from forage fisheries to originate from fisheries meeting a certain score using the FishSource scoring methodology.

To demonstrate the latter, or chain of custody, the salmon producers must purchase feed from a feed supplier who follows an internationally recognized certification scheme that ensures traceability from the fishery, through fishmeal and fish oil processing, then to the feed manufacturer. Thorough traceability is needed in order to understand where fisheries products in feed originate so that the sustainability of each feed component can be analyzed through FishSource or an equivalent scheme. Some traceability schemes that can be used for a producer to achieve 4.3.3, such as the International Fishmeal and Fish Oil Organization Global Standard for

²⁰ Food and Agricultural Organization of the United Nations (FAO)

²¹ Trimmings are defined as by-products when fish are processed for human consumption or if whole fish is rejected for use of human consumption because the quality at the time of landing do not meet official regulations with regard to fish suitable for human consumption

²² The International Union for the Conservation of Nature reference can be found at <http://www.iucnredlist.org/static/introduction>

Responsible Supply, also incorporate baseline measures related to sustainability that serve as an additional measure to ensure that fish from unsustainable fisheries are not used in feed.

Last, standard 4.3.4 incorporates a component that relates to the source of fisheries by-products and trimmings and prohibits the use of those species categorized as vulnerable or worse on the IUCN Red List of Threatened Species. Using by-products from fisheries for human consumption in salmon feeds is a valuable use of products that may otherwise be wasted. However, a minimum level of sustainability of these fisheries is still required under the SAD standards.

Additional information

In the interim period, the feed-related standards are not absolute in demanding that 100% of the origin of fishmeal and fish oil meets a minimum FishSource score. The reason for this is that fishmeal and fish oil are sold as blends where the origin of fisheries can come for multiple fisheries, making it complex and prohibitive to require all fishmeal and fish oil to meet this standard. Additionally, at the moment, it is unclear whether FishSource (or an equivalent scheme) has the ability to do a correct and updated evaluation of all the fisheries in the world that potentially can be used for fishmeal and fish oil production.

Similarly, so that the feed-related standards do not become a barrier to SAD certification, the standard does not demand that 100% of the fishmeal and fish oil must come from ISEAL-accredited fisheries in the future. .

Article 6 of the FAO Code of Conduct for Responsible Fisheries states that “The harvesting, handling, processing and distribution of fish and fishery products should be carried out in a manner which will maintain the nutritional value, quality and safety of the products, reduce waste and minimize negative impacts on the environment.” It also states that “Responsible fish utilization should encourage those involved in fish processing, distribution and marketing to reduce post-harvest losses and waste.”

🚩 The decision around setting the standard for 4.3.2 has been challenging and the SC is still grappling with options for this standard. Feedback on how to proceed is welcomed. The key points and options under discussion are explained below.

Background information and challenges

- The SC hopes that this standard will drive change within the forage fishery sector and improve the sustainability of those fisheries, and highlight those that have achieved high marks for sustainability.
- Balancing setting an achievable standard that represents better environmental performance, and that will also encourage future better performance of fisheries, has proven particularly challenging for this standard.
- FishSource scores fisheries in five areas²³ related to sustainability. Fisheries scientists have advised the SC that some of these areas (e.g., FishSource scores 1 and 4) are the most important for sustainability, from a fisheries science point of view. Because of this, it is important to set a minimum allowable score for each category (or, at a minimum the categories related to harvest rates and biomass), rather than an average minimum allowable score.
- If existing measures of sustainability consider a fishery to be relatively well managed, then it will typically score 8 or more out of 10 on FishSource.

²³ See Appendix IV subsection 3 for details on the 5 areas.

- The level at which this particular standard is set will have large implications for how achievable the SAD standards are overall. A minimum FishSource score of 8 in all categories would lead to a very small volume of fishmeal and fish oil in the market that is acceptable under the standard, for which salmon producers would need to compete (with other aquaculture and other buyers). See Appendix IV subsection 3 for detailed information.

Proposal under discussion:

- No individual FishSource score <6.0, maximum of one N/A, and no N/A in the biomass stock assessment category (score 4).
- Potential requirement to increase the minimum individual FishSource score to <8.0 (and maximum of one N/A, and no N/A in the biomass stock assessment category) within 2 or 3 years of the publication of the SAD standard (approximately the year 2013).
- As specified in 4.3.1, requirement to commit to use independently certified fishmeal and fish oil within five\5 years of the publication of the SAD standard. The understanding of the SC is that a number of forage fisheries are currently considering applying for MSC certification, which, if approved, would meet the requirements of 4.3.1.

Pending questions and concerns related to the proposal:

- What will happen if, within 2 to 3 years, a FishSource score of 8 isn't attained by more than a very small percentage of fishmeal and fish oil products? This could happen due to lack of data or due to fisheries providing data and failing to achieve a score of 8. How risky is it to set an interim standard that could mean that, in 3 to 5 years, we have no choice but to revoke certifications due to feed source?
- Concerns have been expressed that a FishSource score of 6 does not represent good fishery performance from a sustainability perspective and an interim score of this level will be hard for conservation interests to accept, especially if there is no guarantee of raising this score in the future. A FishSource score of 6 was proposed because it is in line with the SAD's aim to allow approximately 25% of the salmon industry to meet the SAD standard. The SC is faced with the challenge that this FishSource score does not represent ecological sustainability.

Criterion 4.4 Source of non-marine raw materials in feed

INDICATOR	STANDARD
4.4.1 Presence and evidence of a responsible sourcing policy for the feed manufacturer for feed ingredients which comply with recognized crop moratoriums ²⁴ and local laws ²⁵	Yes
4.4.2 Documentation of use of transgenic ²⁶ plant raw material,	Yes, for raw materials containing more

²⁴ Moratorium: A period of time in which there is a suspension of a specific activity until future events warrant a removal of the suspension or issues regarding the activity have been resolved. In this context, moratoriums may refer to suspension of the growth of defined agricultural crops in defined geographical regions.

²⁵ Specifically, the policy shall include that vegetable ingredients, or products derived from vegetable ingredients, must not come from the Amazon Biome as geographically defined by the Brazilian Soya Moratorium. Should the Brazilian Soy Moratorium be lifted, this specific requirement shall be reconsidered.

or raw materials derived from genetically modified plants, in the feed

than 1% transgenics

Rationale

Feed ingredients that are sourced from areas where significant ecological damage has occurred was of concern to the SAD. Thus, the SAD requires producers to provide evidence that they are sourcing feed products from feed manufacturers that have a sustainable sourcing policy for feed ingredients. The validation of these origins will require feed ingredient traceability. The SAD initiates this validation by requiring producers to demonstrate that they can trace the specific ingredients in the feed they purchase (see criterion 4.1). Once traceability is in place, the salmon producers and auditors will be able to determine the conditions of the environment where these ingredients are sourced. This will enable future requirements within the SAD to limit the sourcing of ingredients to areas where the production of these ingredients is causing the least damage. For now, the standard requires producers to source feed from feed producers who comply with any relevant recognized crop moratoriums, which, at the time of the writing of these draft standards, includes only the Brazilian Soy Moratorium,²⁷ as far as the SC understands. Such moratoriums are temporary measures intended to protect defined geographic regions.

Although a responsible sourcing policy cannot be validated for all aspects of feed production by salmon producers, it provides a layer of accountability for salmon producers and enables them to use their purchasing preferences to improve, where necessary, the practices of their feed suppliers. When the SAD standards are updated and revised, the addition of a requirement for the certification of key vegetable ingredients by independent, third-party sustainability schemes should be considered. Specifically, the SAD will encourage the ASC to require, during the standards update process, a review of whether the standard should demand that vegetable ingredients,, or products derived from vegetable ingredients,, must originate from an ISEAL-accredited certification scheme.

Genetically modified plants are commonly used in all parts of the world. Some consumers and retailers would like to be able to identify food that comes from sources that do not use genetically modified plants, directly or indirectly through the feed. By ensuring that that information shall be available if needed, one can ensure that this information is present to buyers (e.g., retailers) that would like to consider this when purchasing their products. If the feed contains genetically modified plant raw material, or raw materials derived from genetically modified plants, salmon producers must be able to provide information to the buyer about the use of genetically modified ingredients in feed. In order to accomplish this, salmon producers will need to collect information regarding raw materials that are derived from genetically modified material from their feed producer. The feed producer can provide evidence that genetically modified raw materials are not present in the feed through analytical results and identity preservation programs.

Criterion 4.5 Non-biological waste from production

INDICATOR

STANDARD

²⁶ Transgenic: Containing genes altered by insertion of DNA from an unrelated organism. Taking genes from one species and inserting them into another species to get that trait expressed in the offspring.

²⁷ See http://www.abiove.com.br/english/ss_moratoria_us.html for additional information on the soy moratorium.

4.5.1	Presence and evidence of a functioning policy for proper and responsible treatment of non-biological waste from production (e.g., disposal and recycling)	Yes
4.5.2	Evidence that non-biological waste (including net pens) from grow-out site is either disposed of properly or recycled	Yes

Rationale

The purpose of these indicators is to ensure that all non-biological waste produced by a farm is recycled, reused or disposed of properly and does not affect neighboring communities.

Additional information

The SAD recognizes that some farms are located in extremely remote locations with no viable recycling systems nearby and where waste disposal presents challenges. For this reason, the SAD may decide to edit this standard to require an improvement plan for farms related to waste disposal. Auditing guidelines will need to clarify what “proper” disposal means.

Criterion 4.6 Energy consumption and greenhouse gas emissions on farm

INDICATOR	STANDARD	
4.6.1	Presence of an energy use assessment verifying the energy consumption on the farm and representing the whole life cycle at sea (see Appendix V for guidance and required components of the records & assessment)	Yes, measured in kilojoule/mt fish/production cycle
4.6.2	Records of greenhouse gas (GHG ²⁸) emissions ²⁹ on farm and evidence of an annual GHG assessment	Yes
4.6.3	Documentation of GHG emissions of the feed ³⁰ used to produce the salmon at site of certification according to ISO-compliant life cycle assessment methodology ^{31, 32}	Yes

²⁸ For the purposes of this standard, GHGs are defined as the six gases listed in the Kyoto Protocol: carbon dioxide (CO₂); methane (CH₄); nitrous oxide (N₂O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF₆)

²⁹ GHG emissions must be recorded using recognized methods, standards and records

³⁰ GHG emissions from feed can be given based on the average raw material composition used to produce the salmon (by weight) and not as documentation linked to each single product used during the production cycle.

³¹ Life cycle assessment (LCA) methodology standardized under ISO 14040-14043 (ISO 1997).

³² The scope of the LCA study to determine GHG emissions should include the growing, harvesting, processing and transportation of raw materials (vegetable and marine raw materials) to the feed mill and processing at feed mill. Vitamins

Rationale

Climate change represents perhaps the biggest environmental challenge facing current and future generations. Because of this, energy consumption used in food production has become a source of major public concern. The SAD recognizes the importance of efficient and sustainable energy use. Therefore, these indicators will require that energy consumption in the production of fish should be monitored on a continual basis and that growers should develop means to improve efficiency and reduce consumption of energy sources, particularly those that are limited or carbon-based. The data collected in this process will help the SAD set a meaningful numerical standard for energy use in the future. Energy assessments are a new area for producers. Requiring that farms do these assessments will, likely, raise awareness of the issues related to energy and build support for adding a standard in the future related to the maximum energy of GHG emissions allowed.

Criterion 4.7 Non-therapeutic chemical inputs

INDICATOR	STANDARD
4.7.1 Percentage of copper-treated nets that are cleaned ³³ and treated in situ in the marine environment	0%
4.7.2 Percentage of nets cleaned on land that are cleaned at sites with effluent treatment	100%
4.7.3 Copper concentration in the sediment outside of the Allowable Zone of Effect (AZE) ³⁴ at marine grow-out sites	34 mg Cu/kg dry sediment weight
4.7.4 If the copper level in the sediment is greater than the allowed level in 4.7.3, presence and evidence of a risk assessment conducted by a qualified third party demonstrating that the copper concentration in the sediment does not represent an environmental hazard	Yes
4.7.5 Evidence that the type of biocides used in net antifouling are approved according to legislation in the European Union or United States	Yes

and trace elements can be excluded from the analysis. Method of allocation of GHG emissions linked to by-products must be specified.

³³ Light cleaning of nets should be allowed. Intent of the standard is that, for example, the high pressure underwater washers could not be used on copper treated nets under this standard because of the risk of copper flaking off during this type of heavy or more thorough cleaning.

³⁴ AZE is defined under this standard as 30 meters. Measurements for copper concentration in the sediment shall be taken 30 meters from the edge of the cage (in a downstream direction if there is a clearly identified water flow).

Rationale

Copper (Cu) is an abundant trace element found in a variety of rocks and minerals. It is an essential micronutrient and is also necessary for a wide range of metabolic processes in animals and plants. At elevated levels, however, Cu becomes toxic. The variability in environmental factors makes it very difficult to identify a generic threshold of copper in the environment that can be used to define the environmental risk. In order to minimize release of Cu from salmon farms into the environment, the draft standard includes better management practices of not cleaning copper treated nets in the aquatic environment and requires that land-based cleaning facilities have the appropriate effluent treatment.

Additionally, a maximum level of Cu concentration in the sediment is built into the standard. A precautionary AZE was established at a distance of 30m away from cages. Though the constant distance is recognized as not always applicable in all situations, a precautionary approach allows minimum distances to be incorporated. Experts suggest that the threshold stated (34mg/kg sediment) adequately protects the benthos. Should Cu levels in the sediment be higher than the standard threshold, as may be the case in areas with naturally high levels of Cu, a risk assessment must be conducted to determine whether the Cu presents a threat and the producer qualifies for certification.

The SAD is aware that other biocides are commercially applied to netting material. It is difficult to address all biocides used or to be used in the future. To address the high variability of biocides used, the SAD elected to limit use to those chemicals approved for legal use by the European Union or United States.

Additional information

To be available to biological systems, Cu must be present in a readily soluble form. The form taken by the copper (i.e., ionic, complexed and precipitated), and hence its bioavailability, depends on environmental factors such as pH, redox potential (Eh), soil and sediment type, water hardness and organic content. These factors vary in the environment, making it hard to make global predictions related to Cu toxicity.

PRINCIPLE 5: MANAGE DISEASE AND PARASITES IN AN ENVIRONMENTALLY RESPONSIBLE MANNER

Principle 5 aims to address negative impacts of salmon farming associated with disease, parasites and therapeutic chemical inputs.

Criterion 5.1 Survival and health of farmed fish


5.1.1. Evidence of a fish health management plan for the identification and monitoring of fish diseases and parasites	Yes
5.1.2 Site visits by a designated veterinarian ³⁵ at least four times a year, and by a fish health professional ³⁶ at least once a month	Yes
5.1.3 Percentage of fish that are vaccinated for selected diseases that are known to present a significant risk in the region and for which an effective vaccine exists ³⁷	100%
5.1.4 Percentage of smolt groups ³⁸ tested for select diseases of regional concern prior to entering grow-out phase on farm	100%
5.1.5 Percentage of dead fish removed and disposed of	100%

³⁵ A designated veterinarian is the professional responsible for health management on the farm who has the legal authority to diagnose disease and prescribe medication. In some countries such as Norway, a fish health biologist or other professional has equivalent professional qualifications and is equivalent to a veterinarian for purposes of these standards.

³⁶ A fish health professional is someone with professional expertise in managing fish health.

³⁷ The farm’s designated veterinarian is responsible for undertaking and providing written documentation of the analysis of the diseases that pose a risk in the region and the vaccines that are effective.

³⁸ A smolt group is any population that shares disease risk, including environment, husbandry, and host factors that might contribute to sharing disease agents for each group. Only diseases that are proven, or suspected, as occurring in seawater (and for which seawater fish-to-fish transmission is a concern) but originating in freshwater should be on the list of diseases tested. The designated veterinarian to the smolt farm is required to evaluate, based on scientific criteria and publicly available information, which diseases should be tested for. This analysis shall include an evaluation of whether clinical disease or a pathogen carrier state in fresh water is deemed to have a negative impact on the grow-out phase, thereby disqualifying a smolt group from being transferred. A written analysis must be available to the certifier on demand.

5.1.6	Percentage of dead fish that are recorded and receive a post-mortem analysis	100% ³⁹
5.1.7	Maximum mortality rate of farmed fish during the previous two production cycles	≤25% 
5.1.8	Maximum unexplained mortality rate from the previous two production cycles	≤40% of total mortalities
5.1.9	A farm-specific mortalities reduction program that includes defined annual targets for reductions in mortalities and reductions in unexplained mortalities	Yes

Rationale

Farmed salmon are susceptible to numerous diseases that have the potential to be amplified and transferred, thereby posing a risk to the health of fish and other marine organisms in adjacent ecosystems. One of the best ways to mitigate the risk of disease transfer to wild stocks is to reduce or eliminate the disease from happening initially.

These standards seek to ensure proactive health management on the farm through a detailed health management plan and frequent visits by the designated veterinarian and other fish health professionals. The standards also seek to ensure that farmed salmon have all relevant vaccinations and enter the water as healthy as possible.

Healthy farms also must keep detailed records of all mortalities and cause of death. The post-mortem analysis required in this standard is essential to provide an early warning against emerging diseases. Repeated mortality events from causes such as algae blooms may indicate poor siting of a farm. The mortality standards in 5.1.7 and 5.1.8 are not intended as a goal, but rather a bare minimum required. The farm must be able to demonstrate that it is working seriously to reduce its mortalities. The information collected on mortalities will be useful for future revisions of the standards.

Additional information

Developing standards to prevent disease is a significant challenge for the SAD. While the goal of the SAD is to develop performance-based standards, prescriptive standards can be the best way to address the disease issue. The SAD welcomes feedback or suggestions to make these standards more performance-based. It is expected that these standards are the first step on the disease prevention issue that will be improved with time.

In developing a vaccination standard, the SAD debated who should assess whether a disease presents a significant risk in the region, and whether an effective vaccine exists. Requiring the designated veterinarian to make those judgment calls reflects the fact that risks will vary across regions, and there is no single body today that could determine which vaccines should be used at a given farm. However, the standard, as written, runs the risk of two certified farms in the same region making different judgment calls on vaccines.

³⁹ If on-site diagnosis is inconclusive, this standard requires off-site laboratory diagnosis. A qualified professional must conduct all diagnosis.

For testing of smolt, the SAD SC also is considering requiring that, prior to shipping, evidence must be provided to show that testing revealed less than 1 % mortality over 4 consecutive days and that there were no diseases requiring immediate treatment.

🚩 5.1.7 The SAD SC is considering whether to allow for one or more exceptional mortality events over a period of years if the mortalities are caused by specific incidences (e.g., algal blooms), extraordinary environmental events or atypical disease that are documented to be out of the control of the farmer.

Criterion 5.2 Contamination levels and health effects in local non-target organisms

INDICATOR	STANDARD
5.2.1 On-farm documentation that includes, at a minimum, detailed information on all chemicals and therapeutants used during the most recent production cycle, the amounts used (including grams per ton of fish produced), the dates used, which group of fish were treated and against which diseases, proof of proper dosing, and all disease and pathogens detected on the site	Yes
5.2.2 Allowance for concentrations of selected chemicals and therapeutants in the benthos	TBD 🚩

Rationale

When disease outbreaks occur on salmon farms, farmers often opt to treat with chemical therapeutants, such as SLICE (Emamectin), to reduce the sea lice level and protect the health of the fish (farmed salmon and, in some cases, wild fish). With any chemical introduction into a wild environment there is a need to ensure that non-target organisms are not being negatively impacted by the use of that chemical. For example, SLICE is designed to kill crustaceans, which means that if any feed treated with SLICE escapes the boundaries of the farm there is a risk that non-target (e.g., shrimp and crabs) could be impacted if they ingest the feed containing the chemical.

Accurate and detailed documentation of all treatments is the first step to ensure proper dosing and safe use of therapeutants. The data collected from this standard will also help the SAD set measurable standards in the future. Furthermore, the standards seek a measureable proxy to demonstrate that toxic levels of chemicals aren't accumulating in the environment.

Additional information

The SAD is wrestling with how to create a measureable standard that would ensure treatments are being used in a responsible way and not threatening non-target species. Based on expert input, the substances of greatest concern are sea lice treatments because of their toxicity.

🚩 5.2.2 – The SAD is looking for ideas about how to write a standard for testing chemicals in the benthos. Some of the ideas under discussion are:

- Which chemicals to test for? Perhaps ask a farm to test for the chemical it uses most by volume, the most toxic chemical it uses, and the chemical with the longest half-life. The idea is to have a relatively small number of tests, representing the most troubling chemicals.
- How to take samples and test? The Scottish authorities require sampling of TFBZ (Calcide) 7-days after treatment during max biomass peak at 100 meters from cage edge. EmBZ (SLICE) is sampled 118 days

after treatment during max biomass peak, also 100 meters from cage edge. Additional sampling guidance is needed, particularly for other chemicals. For instance, what level of precision would be required from the test? Are you looking for the chemical itself or a metabolized breakdown of it?

- What would the standard be? One approach is to require testing and reporting of results, but not attempt to set a maximum limit. Another approach would be to attempt to set a limit, such as what the Scottish authorities have done for Calcide and SLICE.⁴⁰ The Dialogue is not yet certain how meaningful that limit is for a potential global standard. A third approach would be to require a farm to allow researchers and third parties to do the testing if they wanted to. There is concern in the Dialogue that this third approach might lead to conflicts and debates over the quality of testing results.

Criterion 5.3 Therapeutic treatments

INDICATOR	STANDARD
5.3.1 Allowance for use of therapeutic treatments that include antibiotics or chemicals that are banned ⁴¹ in any of the primary salmon producing countries ⁴²	None
5.3.2 Percentage of medication events that are prescribed by a veterinarian	100%
5.3.3 Compliance with all withholding periods after treatments	Yes
5.3.4 Allowance for prophylactic use of antimicrobial treatments ⁴³	None

Rationale

To minimize the risk of treatments posing a risk to the environment, farms must not use treatments that have been banned by the regulatory bodies in the world’s largest salmon-producing countries. Prophylactic use of antimicrobial treatments, and treatments that aren’t prescribed by a licensed professional, are unacceptable because they open the door to overuse and abuse of therapeutants.

Criterion 5.4 Resistance of parasites, viruses and bacteria to medicinal treatments


INDICATOR	STANDARD
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⁴⁰ The Scottish regulatory limit for SLICE is EmbZ < 0.763 micrograms / kg wet weight sediment, and for Calcide < 2.0 micrograms / kg dry weight sediment

⁴¹ “Banned” means proactively prohibited by a government entity because of concerns around the substance

⁴² For purposes of this standard, those countries are Norway, UK, Canada, Chile and US

⁴³ The designated veterinarian must certify disease is present before prescribing medication

5.4.1 Participation in an area-based management plan (as outlined in Principle 3) that includes coordinated treatments and coordinated resistance monitoring (see Appendix II for details)	Yes
5.4.2 Bio-assay analysis to determine resistance when two applications of a treatment have not produced the expected effect ⁴⁴	Yes
5.4.3 When bio-assay tests determine resistance is forming, use of an alternative, permitted treatment, or an immediate harvest of all fish on the site	Yes
5.4.4 Use of antibiotics listed as critically important for human medicine by the World Health Organization	None 


Rationale

One of the more serious risks of overusing chemical therapeutants is the development of resistance, which lowers the overall effectiveness. In some salmon-growing regions, resistance to SLICE has become a growing problem, increasing the challenge for salmon farmers to control sea lice on farmed and wild fish.

Efforts to prevent and monitor resistance are done most effectively through an area-based approach. Timely, accurate sea lice counts on the farm can detect when sea lice treatment is no longer effective. Bio-assays are important to confirm if resistance is developing. If a farm doesn't have alternative treatments that are authorized in its jurisdiction and under this standard, immediate harvest of the fish is necessary to halt the outbreak and prevent further development of resistance.

There is a global effort led by the World Health Organization to ensure that antibiotics critical for human medicine are used in a way that doesn't jeopardize their effectiveness in treating human diseases. These standards seek to be in line with that effort.

Additional information



 The SAD is wrestling with how to write a standard that is in line the World Health Organization's push to preserve antimicrobial treatments that are critical for human medicine. An outright ban on using these treatments raises concerns that the farm may not have the tools they need to address disease outbreaks. The SC is considering the following exception to a prohibition against using antimicrobials that are critically important for human medicine: banned, except when there is a policy signed by the farmer and the designated veterinarian acknowledging the concerns surrounding the use of these products and committing to reducing and limiting their use.

⁴⁴ For purposes of this standard, treatments are expected to produce at least a 90% reduction in prevalence of lice on the farmed fish. Compliance with this standard requires that a farm conducts timely, accurate lice counts to ensure it understands the impact of treatments.

This approach goes further than what is currently common practice in livestock animal production. It would reflect the recommendations of the Executive Committee of the Codex Alimentarius Commission in 2001 to discuss issues related to the use of antimicrobials in agriculture (including aquaculture) and veterinary medicine, taking into account the joint role played by antimicrobials as essential human and veterinary medicines and the risk of transferring resistant bacteria to humans or resistance genes to human pathogen bacteria.

Separately, experts have raised concern that resistant parasites, viruses or bacteria might end up in the human food chain if, for instance, they travel from the salmon farm to nearby bivalve aquaculture site. The area-based plans considered in this standard require farms to notify any other aquaculture operations in the area about resistance monitoring and treatments the salmon farms are using (see Appendix II).

Criterion 5.5 Biosecurity management


INDICATOR	STANDARD
5.5.1 Percentage of cages or pens that are single-year class	100%
5.5.2 Percentage of fish transferred live from one sea-based farm site to another, unless explicitly accepted by the designated veterinarian not to increase disease spreading risk	0%
5.5.3 Percentage of fish transported to slaughter in a closed wellboat or a wellboat with discharge treatment and disinfection	TBD 
5.5.4 If exotic diseases and /or parasites are detected on the farm or in the hatchery, evidence of additional biosecurity measures that include restrictions on movement and evidence of strong disease management practices, including culling	Required
5.5.5 Re-occurrence of a specific disease over more than one generation	TBD 


Rationale

Biosecurity measures reduce the risk of disease transmission to the wild and between farms. These standards aim to ensure farms don't harm the health of wild populations by amplifying or spreading disease.

Additional information

The SAD is debating the appropriate standards for fish transport and addressing re-occurring diseases.

 5.5.3 What would be the implications of requiring 100% of all transported fish to be in closed wellboats?

 5.5.5 How can this standard be written in a way that addresses its core intent, which is not wanting to certify farms that have repeated outbreaks of diseases that pose a threat to wild populations and ecosystems?

PRINCIPLE 6: DEVELOP AND OPERATE FARMS IN A SOCIALLY RESPONSIBLE MANNER

Principle 6 aims to address potential negative social impacts related to farm development and operation, including labor concerns.

🚩 The unit of certification for these standards is the salmon farm. The SAD recognizes that a significant percentage of the jobs related to salmon farming are located in processing facilities. The Dialogue is exploring how to ensure a minimum social performance at primary⁴⁵ processing facilities that are used by a farm that seeks certification under these standards. One option is to require that a farm demonstrates that the primary processing facilities that it uses are certified under some other scheme that looks at labor and social issues, such as an ISO standard.

Criterion 6.1 Freedom of association and collective bargaining⁴⁶

INDICATOR	STANDARD
6.1.1 Evidence that workers have access to trade unions (if they exist) and union representative(s) chosen by themselves without managerial interference	Yes
6.1.2 Evidence that workers are free to form organizations, including unions, to advocate for and protect their rights	Yes
6.1.3 Evidence that workers are free and able to bargain collectively for their rights	Yes

Rationale

Having the freedom to associate and bargain collectively is a critical right of workers because it enables them to engage in collective bargaining over issues such as wages and other working conditions. Freedom of Association and the effective recognition of the right to collective bargaining is one of the core principles of the International Labour Organization's (ILO) "Declaration on Fundamental Principles and Rights at Work." The declaration was adopted in 1998 by the 86th International Labour Conference and has since been ratified by the overwhelming majority of ILO's 183 member nation-states.

Auditing guidance

The information below is intended to clarify the intent of the standard related to freedom of association and collective bargaining in order to develop appropriate auditing guidelines that will accompany the final version of the standards.

⁴⁵ Primary processing refers to the first order of processing. It does not include re-processing at second or third processing facilities, as may occur for salmon that are processed multiple times in multiple facilities around the world.

⁴⁶ Bargain collectively: A voluntary negotiation between employers and organizations of workers in order to establish the terms and conditions of employment by means of collective (written) agreements.

- Workers have the freedom to form and join any trade union, free of any form of interference from employers or competing organizations set up or backed by the employer. ILO specifically prohibits “acts which are designated to promote the establishment of worker organizations or to support worker organizations by financial or other means, with the object of placing such organizations under the control of employers or employers’ organizations.”
- Workers can choose their own representatives, without employer interference. Workers are allowed access to worker organizations and their representatives. Employers cannot discriminate against workers who are organized, including unions. Workers have the right to bargain collectively with employers regarding rights and working conditions.
- All workers should have access to trade unions and the ability to bargain collectively or worker access to representative(s) chosen by workers without management interference. For verification, auditors could review policies on Freedom of Association, collective bargaining agreements, meeting minutes, complaints resolutions or worker interviews.
- These standards do not mean all workers of a certified aquaculture operation must be in a trade union or similar organization. The standards mean that workers must not be prohibited from accessing or joining such organizations. If they do not exist or are illegal, companies must make it clear that they are willing to engage in a collective dialogue through a representative structure freely elected by the workers.

Criterion 6.2 Child labor

INDICATOR	STANDARD
6.2.1 Number of incidences of child ⁴⁷ labor ⁴⁸	None
6.2.2 Percentage of young workers ⁴⁹ that are protected ⁵⁰	100%

Rationale

The effective abolition of child labor is one of the core principles of the ILO “Declaration on Fundamental Principles and Rights at Work.” Adherence to the child labor codes and definitions included in this section indicates compliance with what the ILO and international conventions generally recognize as the key areas for the protection of child and young workers. Children are particularly vulnerable to economic exploitation, due to their inherent age-related limitations in physical development, knowledge and experience. Children and youth need adequate time for education, development and play. Therefore, they should not have to work or be exposed to working hours and conditions that are hazardous^{51, 52} to their physical or mental well-being. To this

⁴⁷ **Child:** Any person under 15 years of age. A higher age would apply if the minimum age law of an area stipulates a higher age for work or mandatory schooling.

⁴⁸ **Child Labor:** Any work by a child younger than the age specified in the definition of a child.

⁴⁹ **Young Worker:** Any worker between the age of child, as defined above, and under the age of 18.

⁵⁰ **Protected:** Workers between 15 and 18 years of age will not be exposed to hazardous health and safety conditions; working hours shall not interfere with their education and the combined daily transportation time, school time and work time shall not exceed 10 hours.

⁵¹ **Hazard:** The inherent potential to cause injury or damage to a person’s health (e.g., unequipped to handle heavy machinery safely, and unprotected exposure to harmful chemicals).

end, the standards related to what constitutes child labor will protect the interests of children and young workers at salmon farms certified to these standards.

Auditing guidance

1. Minimum age of permanent workers is 15 years old (or 14, if the country allows it under the developing country exceptions in ILO convention 138). If the legal minimum age allowed in the country is higher than 15 years, the legal minimum age of the country is followed. (Note: Employer is accountable for worker age documentation. In most countries, the law states that the general minimum age for employment is 15 years.)
2. For workers aged 15-18 (i.e., young workers), work shall not conflict with schooling and the combined daily transportation time, school time and work time shall not exceed 10 hours. This standard is compatible with the allowance of internships, technical training or after-school jobs for young workers. Hazardous work (e.g., heavy lifting disproportionate to a person’s body size, operating heavy machinery, working night shifts and exposure to any toxic chemicals) is not performed by those below age 18.
3. Auditors may want to review company policies on young workers, training programs, Personal Protective Equipment and timesheets. They also may want to conduct worker interviews.

Criterion 6.3 Forced, bonded or compulsory labor

INDICATOR	STANDARD
6.3.1 Number of incidences of forced ⁵³ , bonded ⁵⁴ or compulsory labor	None

Rationale

Forced labor - such as slavery, debt bondage and human trafficking - is a serious concern in many industries and regions of the world. The elimination of all forms of forced or compulsory labor is one of the core principles of the ILO “Declaration on Fundamental Principles and Rights at Work.” Ensuring that contracts are clearly articulated and understood by workers is critical to determining that labor is not forced. The inability of a worker to freely leave the workplace and/ or an employer withholding original identity documents of workers are indicators that employment may not be at-will. Employers are never permitted to withhold original worker identity documents. Adherence to these policies shall indicate an aquaculture operation is not using forced, bonded or compulsory labor forces.

Auditing guidance

1. Contracts shall be clearly stated and understood by workers and never lead to a worker being indebted (e.g., workers paying for essential job training programs).

⁵² **Hazardous work:** Work that, by its nature or circumstances in which it is carried out, is likely to harm the health, safety or morals of workers. (e.g., heavy lifting disproportionate to a person’s body size, operating heavy machinery, exposure to toxic chemicals)

⁵³ **Forced (Compulsory) labor:** All work or service that is extracted from any person under the menace of any penalty for which a person has not offered him/ herself voluntarily or for which such work or service is demanded as a repayment of debt. “Penalty” can imply monetary sanctions, physical punishment, or the loss of rights and privileges or restriction of movement (e.g., withholding of identity documents).

⁵⁴ **Bonded labor:** When a person is forced by the employer or creditor to work to repay a financial debt to the crediting agency.

2. Employer shall never be permitted to withhold a worker’s original identity documents. (Note: Extra care shall be given to migrants and contractor/ subcontractor situations because they can be particularly vulnerable without their identity documents).
3. Auditors may wish to choose to review company policy on forced labor, payroll records and worker interviews

Criterion 6.4 Discrimination⁵⁵

INDICATOR	STANDARD
6.4.1 Evidence of comprehensive ⁵⁶ and proactive anti-discrimination policies and practices	Yes
6.4.2 Number of incidences of discrimination	None

Rationale

The elimination of discrimination in respect of employment and occupation is one of the core principles of the ILO “Declaration on Fundamental Principles and Rights at Work.” Unequal treatment of workers based on certain characteristics (such as sex or race), is a violation of a workers’ human rights. Additionally, widespread discrimination in the working environment can negatively affect overall poverty and economic development rates. Discrimination occurs in many work environments and takes many forms. A common form is discrimination against women workers.

In order to ensure that discrimination does not occur at salmon farms certified to this standard, employers must demonstrate their commitment to equality with an official anti-discrimination policy, a policy of equal pay for equal work, as well as clearly outlined procedures to raise, file and respond to a discrimination complaint in an effective manner. Evidence, including worker testimony, of adherence to these policies and procedures will indicate minimization of discrimination. “Positive” discrimination (i.e., special treatment to protect the rights and health of particular groups of workers, or to provide opportunities for groups which have historically been disadvantaged) is allowed, and often required by laws related to such issues as maternity and affirmative action.

Auditing guidance

1. Employers shall have written anti-discrimination policies stating the company does not engage or support discrimination in hiring, remuneration, access to training, promotion, termination or retirement based on

⁵⁵ **Discrimination:** Any distinction, exclusion, or preferences, which has the effect of nullifying or impairing equality of opportunity or treatment. Not all distinction, exclusion, or preference constitutes discrimination. For instance, a merit- or performance-based pay increase or bonus is not by itself discriminatory. Positive discrimination in favor of people from certain underrepresented groups may be legal in some countries.

⁵⁶ Employers shall have written anti-discrimination policies stating the company does not engage or support discrimination in hiring, remuneration, access to training, promotion, termination or retirement based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, age, or any other condition that may give rise to discrimination

race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, age or any other condition that may give rise to discrimination

2. Clear and transparent company procedures are outlined to raise, file and respond to discrimination complaints
3. Employers shall respect the principle of equal pay for equal work and equal access to job opportunities, promotions, raises, etc.
4. Worker testimony shall be able to support that the company does not interfere with the rights of personnel to observe tenets or practices, or to meet needs related to race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, or any other condition that may give rise to discrimination

Criterion 6.5 Work environment health and safety

INDICATOR	STANDARD
6.5.1 Percentage of workers trained in health and safety practices, procedures and policies on a yearly basis	100%
6.5.2 Evidence that workers use Personal Protective Equipment (PPE) effectively	Yes
6.5.3 Presence of a health and safety risk assessment and evidence of preventive actions taken	Yes
6.5.4 Evidence that all health and safety related accidents and violations are recorded and corrective actions are taken when necessary	Yes
6.5.5 Evidence of employer responsibility and/or proof of insurance (accident or injury) for worker costs in a job-related accident or injury when not covered under national law	Yes
6.5.6 Evidence that all diving operations are conducted by divers who are certified for the task	Yes

Rationale

A safe and healthy working environment is essential for protecting workers from harm. It is critical for a responsible aquaculture operation to minimize these risks. One of the key risks to workers is hazards resulting from accidents and injuries. Consistent, effective and regular worker training in health and safety practices is an important preventative measure. When an accident, injury or violation occurs, the company must record it and take corrective action to identify the root causes of the incident, remediate, and take steps to prevent future occurrences of similar incidents. This addresses violations and the long-term health and safety risks. Finally, while many national laws require that employers assume responsibility for job-related accidents and injuries, not all countries require this and not all workers (in some cases migrant and other workers) will be covered under such laws. When not covered under national law, employers must prove they are insured to cover 100% of worker costs when a job-related accident or injury occurs.

Auditing guidance

Guidance for percentage of workers trained in health and safety practices, procedures and policies

1. Emergency response procedures shall exist and be known by workers
2. Offer regular health and safety training for workers (once a year and for all new workers), including training on potential hazards and risk minimization, Occupational Safety and Health (OSH) and effective use of PPE.

Guidance for presence of a health and safety risk assessment and evidence of preventive actions taken

1. Minimization of hazards and risks in the working environment, including documented systemic procedures and policies to prevent workplace hazards and their risks (e.g., risk assessments), shall exist and all workers shall be trained in how to identify and prevent those hazards and risks
Policies, procedures and instructions that are adapted according to the results of risk assessments shall be in place to help prevent accidents from taking place

Guidance for evidence that all health and safety related accidents and violations are recorded and corrective actions are taken when necessary

1. Accidents shall be recorded.
2. Documentation shall be generated with regard to occupational health and safety violations.
3. Corrective action plan shall be implemented in response to accidents that have occurred. This should analyze the root causes, address the root causes, and remediate and prevent future accidents of a similar nature.

Guidance for proof of accident insurance

1. There shall be sufficient insurance to cover workers who suffer accident or injury in the work environment. Special consideration must be given to migrant or foreign workers who may fall outside of the law.

Criterion 6.6 Wages

INDICATOR	STANDARD
6.6.1 The percentage of workers whose basic wage ⁵⁷ (before overtime and bonuses) is below the minimum wage ⁵⁸	0 (None)
6.6.2 Evidence that the employer is working towards the payment of basic needs wage ⁵⁹	Yes
6.6.3 Evidence of transparency in wage-setting	Yes

⁵⁷ **Basic wage:** the wages paid for a standard working week (no more than 48 hours)

⁵⁸ If there is no legal minimum wage in a country, basic wages must meet the industry-standard minimum wage.

⁵⁹ **Basic needs wage:** A wage that covers the basic needs of an individual or family, including housing, food, transport, etc. This concept differs from a minimum wage, which is set by law and may or may not cover the basic needs of workers.

Rationale

Wages and the process for setting wages are important components of the ILO core principles. For this reason, it is important to highlight under these standards the importance of workers' basic wages meeting the legal minimum wage and being rendered to workers in a convenient manner. Unfortunately, minimum wage in many countries does not always cover the basic needs of workers. Unfairly and insufficiently compensated workers can be subject to a life of sustained poverty. Therefore, it is important for socially responsible employers to pay or be working towards paying a basic needs wage. The calculation of a basic needs wage can be complex and it is important for employers to consult with workers, their representatives and other credible sources when assessing what a basic needs wage would be.

Certified salmon farms shall also demonstrate their commitment to fair and equitable wages by having and sharing a clear and transparent mechanism for wage-setting and a labor conflict resolution policy⁶⁰ that tracks wage-related complaints and responses. Having these policies outlined in a clear and transparent manner will empower the workers to negotiate effectively for fair and equitable wages that shall, at a minimum, satisfy basic needs.

Auditing guidance

1. Employers shall ensure that wages paid for a standard working week (no more than 48 hours) always, at a minimum, meet legal/ industry minimum standards. Piece-rate and pay-per-production are reasonable and attainable within regular working hours.
2. Employers shall demonstrate assessment of workers' basic needs and the corresponding wage.
3. Employers shall demonstrate that they have taken steps towards achieving a basic needs wage for their workers.
4. Wage and benefits are clearly articulated to workers and are rendered to workers in a convenient manner. Workers don't need to travel to collect benefits, and promissory notes, coupons or merchandise never replace cash/ electronic/ check payment methods.
5. Clear and transparent mechanism for wage setting shall be known to workers
6. Auditors may review payroll, timesheets, punch cards, production records, utility records, and worker interviews.

Criterion 6.7 Contracts (labor) including subcontracting

INDICATOR

STANDARD

⁶⁰ See Criterion 6.8.

6.7.1 Percentage of workers who have contracts ⁶¹	100%
6.7.2 Evidence of a policy to ensure social compliance of its suppliers and contractors	Yes

Rationale

Fair contracting is important to ensure transparency between the employer and employee and fairness in the employment relation. Short-term and temporary contracts are acceptable but cannot be used to avoid paying benefits or to deny other rights. The company shall also have policies and mechanisms to ensure that workers contracted from other companies for specific services (e.g., divers, cleaning or maintenance) and the companies providing them with primary inputs or supplies have socially responsible practices and policies.

Auditing guidance

Auditor may review contracts and worker interviews to determine compliance with 6.7.1.

Auditor may review contracts and communications with suppliers and subcontractors to determine compliance with 6.7.2. The producing company should have a map of suppliers and subcontractors as well as evaluation criteria for suppliers and subcontractors.

Criterion 6.8 Conflict resolution

INDICATOR	STANDARD
6.8.1 Evidence of worker access to effective, fair and confidential grievance procedures	Yes
6.8.2 Percentage of grievances handled that are addressed ⁶²	100%
6.8.3 Percentage of grievances that are resolved ⁶³	≥70%

Rationale

⁶¹ Labor-only contracting relationships or false apprenticeship schemes are not acceptable. This includes revolving/ consecutive labor contracts to deny benefit accrual or equitable remuneration. **False Apprenticeship Scheme:** The practice of hiring workers under apprenticeship terms without stipulating terms of the apprenticeship or wages under contract. It is a “false” apprenticeship if its purpose is to underpay people, avoid legal obligations, or employ underage workers. **Labor-only contracting arrangement:** The practice of hiring workers without establishing a formal employment relationship for the purpose of avoiding payment of regular wages or the provision of legally required benefits, such as health and safety protections

⁶² **Addressed:** acknowledged and received, moving through the company’s process for grievances

⁶³ **Resolved:** acknowledged, received and moved through the company’s process for grievances and then corrective action taken as needed to resolve the grievance to mutual satisfaction.

Companies must have a clear labor conflict resolution policy in place for the presentation, treatment and resolution of worker grievances in a confidential manner. Workers shall be familiar with the policy and its effective use. Such a policy is necessary to track conflicts and complaints raised, as well responses to conflicts and complaints.

Auditing guidance

Auditors shall review grievance procedures, meeting minutes, evidence of resolution, and conduct worker interviews.

Labor conflict resolution policy shall be in place to track conflicts and complaints raised, as well as responses to conflicts and complaints

Criterion 6.9 Disciplinary practices

INDICATOR	STANDARD
6.9.1 Incidences of excessive or abusive disciplinary actions	None
6.9.2 Evidence of a functioning disciplinary action policy whose aim is to improve the worker ⁶⁴	Yes

Rationale

The rationale for discipline in the workplace is to correct improper actions and maintain effective levels of worker conduct and performance. However, abusive disciplinary actions can violate workers’ human rights. The focus of disciplinary practices shall always be on the improvement of the worker. Fines or basic wage deductions shall not be acceptable as methods for disciplining workforce. A certified salmon farm shall never employ threatening, humiliating or punishing disciplinary practices that negatively impact a worker’s physical and mental⁶⁵ health or dignity.

Auditing guidance

Auditors shall investigate any allegations of corporeal punishment, mental or physical coercion, or verbal abuse. Verification shall be done through interviews and evidence that disciplinary policies and practices are transparent, fair and effective. Auditors may wish to review disciplinary procedures, worker evaluation criteria and reports, and worker interviews.

Criterion 6.10 Working hours and overtime

INDICATOR	STANDARD
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⁶⁴ If disciplinary action is required, progressive verbal and written warnings shall be engaged. Aim shall always be to improve the worker; dismissal shall be the last resort Policies for bonuses, incentives, access to training and promotions are clearly stated and understood and not used arbitrarily.

⁶⁵ **Mental Abuse:** Characterized by the intentional use of power, including verbal abuse, isolation, sexual or racial harassment, intimidation, or threat of physical force

6.10.1 Incidences, violations or abuse of working hours ⁶⁶ and overtime laws	None
6.10.2 Overtime is limited, voluntary ⁶⁷ , paid at a premium rate and restricted to exceptional circumstances	Yes

Rationale

Abuse of overtime working hours is a widespread issue in many industries and regions. Workers subject to extensive overtime can suffer consequences in their work-life balance and are subject to higher fatigue-related accident rates. In accordance with better practices, workers in certified salmon farms are permitted to work—within defined guidelines—beyond normal work week hours but must be compensated at premium rates⁶⁸. Requirements for time-off, working hours and compensation rates as described should reduce the impacts of overtime.

Auditing Guidance

Auditors shall be aware of working hours and overtime requirements in local legislation. They can check time sheets and payroll and verify through worker interviews that workers are working the number of hours allowed under the law. Pay slips and pay records can confirm whether overtime hours are being paid at a premium. To verify that overtime is not the norm, interviews can be conducted and production records, time sheets and other records of working hours from at least one year before can be checked. Worker interviews to determine whether overtime is voluntary are key. Some exceptions can be made for overtime not being voluntary, if there is a collective bargaining agreement in place that allows for such overtime.

Criterion 6.11 Education and training

INDICATOR	STANDARD
6.11.1 Evidence that the company encourages and sometimes supports education initiatives for all workers (e.g., courses, certificates and degrees)	Yes

Rationale

Education and training can be beneficial to companies and enable workers to improve their incomes. Such human capital development should be encouraged where it is in the interest of the company. Incentives, such as subsidies for tuition or textbooks and time off prior to exams, should be offered. The offer of training may be

⁶⁶ In cases where local legislation on working hours and overtime exceed internationally accepted recommendations (48 regular hours, 12 hours overtime), the international standards will apply.

⁶⁷ Compulsory overtime is permitted if previously agreed to under a collective bargaining agreement.

⁶⁸ **Premium rate:** A rate of pay higher than the regular work week rate. Must comply with national laws/ regulations and/or industry standards.

contingent on workers committing to stay with the company for a pre-arranged time. This should be made clear to participants before they start the training.

Auditing guidance

Auditors can check for evidence of courses taken, review curriculum for relevance and interview workers for effectiveness and satisfaction.

PRINCIPLE 7: BE A GOOD NEIGHBOR AND CONSCIENTIOUS CITIZEN

Principle 7 aims to address any broader off-site potential social impacts associated with salmon production, including interactions with local communities.

Criterion 7.1 Community Engagement

INDICATOR	STANDARD
7.1.1 Evidence of regular and meaningful ⁶⁹ consultation and engagement with community representatives and organizations	Yes
7.1.2 Presence and evidence of an effective ⁷⁰ policy and mechanism for the presentation, treatment and resolution of complaints by community stakeholders and organizations	Yes
7.1.3 Evidence of effective complaints management and resolution	Yes
7.1.4 Evidence of third party assessment of health effects on community	Yes
7.1.5 Evidence of effective communication with community representatives to ensure that any displacement of communities will not have adverse impacts	Yes ⁷¹

Rationale

A salmon farm must respond to human concerns that arise in communities located near the farm, as well as to concerns related to the farm's overall operations. In particular, appropriate consultation must be undertaken within local communities so that potential conflicts are properly identified, avoided, minimized and/or mitigated through open and transparent negotiations. Risks and current impacts on the surrounding communities should be assessed. Communities should have the opportunity to be part of the assessment process (e.g., by including them in the discussion of any social investments and contributions by companies to neighboring communities).

Channels of communication with community stakeholders are important. Regular consultation with community representatives and a transparent procedure for handling complaints are key components of this communication. Negative impacts may not always be avoidable. However, the process for addressing them must be open, fair and transparent and demonstrate due diligence. A company should make a maximum effort to prevent displacement of local communities as a result of the company's presence and activities. A company should prevent damage to the health and safety of the surrounding community as a result of the company's

⁶⁹ **Regular and meaningful:** Meetings should be held at least bi-annually with elected representatives of affected communities. The agenda for the meetings should in part be set by the community representatives. Participatory Social Impact Assessment methods may be one option to consider here.

⁷⁰ **Effective:** In order to demonstrate that the mechanism is effective, evidence of resolutions of complaints can be given.

⁷¹ For sites established after the publication of the SAD standard.

presence and activities. Among the impacts to minimize is pollution that could affect communities (e.g., noise or air pollution).

Auditing guidance

Auditors may wish to review meeting reports, minutes and interviews with community representatives for 7.6.1. For 7.6.2, auditors may wish to review complaints procedures and policies, documentation of communications with stakeholders, documentation of corrective actions taken by the company, and reports to stakeholders on actions taken and solutions.


Criterion 7.2 Respect for indigenous and aboriginal cultures and traditional territories

INDICATOR	STANDARD
7.2.1 Evidence of acknowledgement of indigenous groups’ rights and titles (where applicable)	Yes
7.2.2 Evidence of established agreements or an ongoing process to establish agreements with relevant communities in the traditional territories	Yes
7.2.3 Evidence of successful consultation with aboriginal people and support from governance structures in the locality prior to site license approval ⁷²	Yes 

Rationale

Interactions with and evidence of due diligence to prevent and mitigate negative impacts on communities is important globally, and takes on an additional dimension in regions where indigenous or aboriginal people or traditional territories are involved. In some jurisdictions, aboriginal groups have legal rights related to their territories. These shall be respected, as in Principle 1. It is also expected that operations seeking to meet the SAD standards have directly consulted with bodies functioning as territorial governments.

Additional information

 Questions have been raised about how best to improve upon the standards under 7.3, as these standards may be difficult to interpret and audit as currently written. Among the questions are how to address issues around existing sites and how to manage changing governance of the groups, given that that can lead to changes in approval or support. In particular, the question of if and/or how to apply 7.2.3 to existing farms is under discussion.

Criterion 7.3 Access to resources

INDICATOR	STANDARD
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⁷² For sites established after the publication of the SAD standard.

7.3.1 Changes undertaken restricting access to vital community resources ⁷³ without community approval	None
7.3.2 Evidence of assessments of company's impact on access to resources	Yes

Rationale

Companies should make a maximum effort to not affect the surrounding community's access to vital resources as a result of its presence and activities. Some change in access is expected. What is to be prevented is an unacceptable degree of change.

Auditing guidance

Auditors may choose to look at assessments, meeting reports and minutes, interview with community representatives to verify compliance. Auditing guidance on these issues must be further developed to clarify intent of the standard.

⁷³ Vital community resources can include freshwater, land or other natural resources that communities rely on for their livelihood. If a farm site were to block, for example, a community's sole access point to a needed freshwater resource, this would be unacceptable under the Dialogue standard.

PRINCIPLES, CRITERIA, INDICATORS AND STANDARDS FOR SMOLT PRODUCTION

🚩 The draft standards for smolt production are not as fully developed as those for grow-out. However, the SC wants to share and collect feedback on the rough draft smolt standards so it can solicit ideas for improving the draft and be transparent by sharing work-to-date.

In the proposal below, standards labeled “NETPEN” are applicable to net pen and cage systems (open systems). Standards labeled “FLOW” are applicable to flow-through or recirculating systems (where influent and effluent can be measured and, to some degree, controlled). Where neither label is noted, the standards apply to all forms of smolt production systems. A number of the standards described in the grow-out section of the document are also applicable to smolt production, and are noted as such in this section of the standards. The numbering X.X.XS is intended to differentiate the smolt standards with the letter “S” from any grow-out standard with the same number.

Significant concerns have been raised about the effects of smolt production in open systems (i.e., net pens and cages). Impacts from open smolt production systems include disease transmission and amplification, escapes, nutrient loading and exceeding carrying capacity, and the release of antibiotics and chemicals into freshwater ecosystems. The vast majority of salmon smolt production takes place in closed or semi-closed systems where these impacts can be significantly reduced in a way that is not possible in fully open systems, such as net pens. These closed production systems can also have benefits for producers in terms of improved biosecurity and improved fish health.

Some of the concerns related to open smolt production, such as disease transmission and the genetic effect of escapees, have been highlighted as being particularly important in regions where native salmonids exist. For this reason, the draft SAD standards allow only closed or semi-closed smolt systems to be certified under the SAD standard in areas of wild salmonids. This is described under standard 3.1.1S that is within criterion 3 below.

Additionally, due to the broader range of impacts associated with open net pen smolt production in all regions, and the particular ecological importance of freshwater lakes in Chile, the largest salmon producer in the non-native range, the SAD standards propose to phase out all net pen smolt production under the standard within a few years. This is described under standard 3.1.2S that is within criterion 3 below. Chile’s freshwater systems have distinctive environmental characteristics and are known for their high levels of endemism. Freshwater biodiversity and the vast majority of native freshwater fish species in Southern Chile are currently threatened and net pen production of salmon smolt is one of a number of contributing factors to the decline of freshwater systems and species⁷⁴.

⁷⁴ Various sources as summarized in: León-Muñoz, Jorge; Tecklin, David; Farías, Aldo and Díaz, Susan. 2007. Salmon Farming in the Lakes of Southern Chile - Valdivian Ecoregion. History, tendencies and environmental impacts. Valdivia, Chile: WWF. Full report at: http://assets.panda.org/downloads/informe_salmones_lagos_sur_de_chile_restriccion.pdf

PRINCIPLE 1: COMPLY WITH ALL APPLICABLE INTERNATIONAL AND NATIONAL LAWS AND LOCAL REGULATIONS

Under the SAD standards, smolt production facilities must meet the same standards related to Principle 1 as grow-out facilities. See standards 1.1.1 – 1.1.4 above for reference.

PRINCIPLE 2: CONSERVE NATURAL HABITAT, LOCAL BIODIVERSITY AND ECOSYSTEM FUNCTION

Criterion 2.1: Benthic biodiversity and benthic effects

Rationale and additional information

Benthic effects from open smolt production systems can be significant and are important to address in the standards. For semi-closed production systems, such as flow-through and re-circulating systems, water quality is the most important point of control. Additionally, sediment traps to limits emissions of solids that might affect the benthos are required under criteria 2.3.

Several possibilities for addressing benthic impacts of smolt production systems are under consideration. They include setting a maximum sulfide level or minimum redox potential under cages, requiring a benthic faunal measurement and minimum accepted level of benthic biodiversity, and requiring demonstration that benthic sediments under the cages have not reached hypoxic or anoxic conditions within the last five years.

Criterion 2.2 Water quality in and near site of operation

INDICATOR	STANDARD
2.2.1S NETPEN: For any “open” system (e.g. net pen), evidence that carrying capacity of the freshwater body has been established by a reliable entity. ⁷⁵ Analysis must take into account the natural ecological condition of the lake or water body (e.g., oligotrophic) and have been conducted within a recent (2 years) timeframe.	Yes
2.2.2S NETPEN: Evidence that total biomass present in freshwater body (e.g., a lake) falls within the established carrying capacity.	Yes

⁷⁵ Could be done in the form of an Environmental Impact Statement (EIS) and must be undertaken by an independent body. Criteria to be considered in the analysis should include but not be limited to water transparency, total phosphorous levels, total suspended solids and total ammonia-nitrogen levels. The same independent EIS can be used under 2.2.2S to demonstrate that all salmon smolt production facilities (either certified or not) operating in the lake are within the carrying capacity levels established.

2.2.3S	NETPEN: Instances of use of aeration systems or other technological means of increasing oxygen levels in the water body	0
2.2.4S	FLOW: Average % change of total phosphorous between inlet and outlet	Maximum X%
2.2.5S	FLOW: Average % change of total nitrogen between inlet and outlet	Maximum X%
2.2.6S	FLOW: DO concentration in water discharged	At all times; DO in water discharged \geq X mg/l
2.2.7S	FLOW: Total phosphorous concentration limit in receiving waters	< X μ g /L

Rationale

Nutrient loading has been highlighted as a key impact of open smolt production systems, in particular in some of the unique freshwater lakes in Southern Chile where there is slow turnover of water. The SAD is proposing to develop a suite of water quality standards to address potential impacts from open and closed or semi-closed smolt production systems. For open systems, such as net pens in lakes or rivers, the SC proposes that farms must fall within the specific carrying capacity of the ecosystem in which they are located. This will require an individualized environmental and carrying capacity analysis of the farm site. An additional standard to help ensure that any open systems naturally fall within the carrying capacity of the site is to prohibit the use of aeration or other oxygenation systems under the standard.

For smolt systems where effluents can be controlled and measured, a different suite of standards is being proposed. The proposal under discussion would set a maximum allowable percent increase of parameters such as P, TSS, BOD, and N between the influent and effluent waters. It also would set a maximum cap on levels in the effluent of the same parameters (see criterion 2.3). Additionally, to avoid the excessive loading of nutrient-poor systems, a limit on the total phosphorus concentration in these receiving waters is being proposed (see criterion 2.2.7). This combination of standards will consider the attribution of the farm and the health of the receiving waters.

Additional information


🚩 The SC is still in the process of researching what appropriate thresholds for these indicators should be under the standard. The SC also is researching whether it is possible to shorten the list of parameters measured while continuing to ensure that the standards effectively measure environmental health and minimize impacts. In particular, the potential removal of the standard related to nitrogen is under discussion.

An alternate proposal related to the net pen smolt systems is to require the development of a water quality standard for each lake or river ecosystem where there are open systems wishing to be certified under the SAD standards. Producers in those areas would then be required to meet those standards.


Criterion 2.3: Nutrient release from production

INDICATOR	STANDARD
2.3.1 FLOW: Maximum level of phosphorous in effluent	X in rivers, Y in lakes
2.3.2 FLOW: Maximum level of BOD (or, possibly, DO) in effluent	X in rivers, Y in lakes
2.3.3 FLOW: Maximum level of TSS in effluent	X in rivers, Y in lakes
2.3.4 FLOW: Evidence of use of sediment traps	Yes
2.3.5 FLOW: Direct discharge of sludge and evidence of a sludge repository and sludge use	No direct discharge of sludge in public water bodies or natural ecosystems. Also, there must be evidence of a sludge repository (of appropriate size) and of sludge being used.

Additional information

 The SC is still in the process of researching what the appropriate thresholds for these indicators should be under the standard.

Criterion 2.4: Interaction with critical or sensitive habitats and species

 Two ideas have been discussed related to standards to ensure that smolt production facilities minimize negative impacts on any critical or sensitive habitats and species. The first is to require producers to demonstrate that the siting of freshwater sites takes into account natural sanctuaries, protected areas and other similar areas both in the aquatic environment and adjacent land. How this might be audited is under discussion. Secondly, the SC is discussing developing a matrix that producers would need to complete. The matrix would need to detail the site location, history, potential negative impacts on habitats and species, and stewardship activities. This would help to ensure that farms are aware of the impacts they may have and ways to reduce them.

Criterion 2.5: Interaction with wildlife, including predators

INDICATOR	STANDARD
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2.5.1S Number of mammals and birds killed through the use of lethal action ⁷⁶	0
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PRINCIPLE 3: PROTECT THE HEALTH AND GENETIC INTEGRITY OF WILD POPULATIONS

Under the SAD standard, smolt production facilities must meet standards 3.2.1 around exotic species, 3.3.1 around transgenic fish, and the escapes standards under 3.4.

🚩 The SC is considering whether to set a revised 3.4.1 escapes standard specific to smolt, such as unexplained loss no greater than 0.25% more than the stated accuracy of the counting machines or counting methodology.

In addition, smolt facilities must meet these standards:

INDICATOR	STANDARD
3.1.1S Production or holding of smolt in net pens or cages in areas where there are native salmonids	None
3.1.2S Production or holding of smolt in net pens or cages within X years of the publication of the SAD standard	None 🚩

Rationale

Significant concerns have been raised about the effects of smolt production in open systems (i.e., net pens and cages). Impacts of concern include the effect of escapees on wild fish populations, nutrient loading, disease transmission, and antibiotics and chemicals entering the freshwater environment. The vast majority of salmon smolt production takes place in closed or semi-closed systems where these impacts can be significantly reduced in a way that is not possible in fully open systems, such as net pens. The introduction and amplification of parasites and pathogens, as well as the potential genetic effects of escapees, have been raised as particularly concerning in areas where native salmonids exist. For this reason, the draft SAD standards allow only closed or semi-closed smolt systems to be certified in areas of wild salmonids.

🚩 Additionally, due to the broader range of impacts associated with open net pen smolt production in all regions, and the particular ecological importance of freshwater lakes in Chile (which is the largest salmon producer in the non-native range), the SAD standards propose to phase out all net pen smolt production under the standard within a few years. Many smolt in Chile are already currently being produced in re-circulating or semi-closed systems and this trend is expected to increase. Therefore, SAD standards propose to phase out all net pen smolt production under the standard within a few years. The timeframe for doing so is under discussion.

⁷⁶ Lethal action: Action taken to deliberately kill an animal, including mammals and birds. Accidental entanglement is not considered lethal action. Exceptions can be made for actions taken to avoid personal injury.

PRINCIPLE 4: USE RESOURCES IN AN ENVIRONMENTALLY EFFICIENT AND RESPONSIBLE MANNER

Under the SAD standards, smolt production facilities must meet standards 4.5.1 and 4.5.2, which are related to non-biological waste from production. They must also meet standards 4.6.1 and 4.6.2, which are related to monitoring energy use and GHG emissions.

PRINCIPLE 5: MANAGE DISEASE AND PARASITES IN AN ENVIRONMENTALLY RESPONSIBLE MANNER

Under the SAD standards, smolt production facilities must meet the health standards under 5.1, 5.2 and 5.3, as well as biosecurity standards 5.5.4 and 5.5.5.

🚩 The SC is considering whether to set a smolt-specific mortalities standard in 5.1.7.

🚩 The SC is considering how to make the resistance standards of 5.4 relevant for smolt facilities.

PRINCIPLE 6: DEVELOP AND OPERATE FARMS IN A SOCIALLY RESPONSIBLE MANNER

Under the SAD standards, smolt production facilities must meet the same standards related to Principle 6 as grow-out facilities. See standards 6.1.1 - 6.11.1 above for reference.

PRINCIPLE 7: BE A GOOD NEIGHBOR AND CONSCIENTIOUS CITIZEN

Under the SAD standards, smolt production facilities must meet the same standards related to Principle 7 as grow-out facilities. See standards 7.1.1 – 7.4.1 above for reference.

Appendix I: Methodologies related to Principle 2

1. Sampling methodology for calculation of AMBI and macrofaunal taxa

AZTI Marine Biotic Index (AMBI) should be conducted at nine stations in duplicate during peak cage biomass. No station should report less than two species of worms.

- Two stations should be from the cage edge, one at each end of the long axis of the farm
- Three should be from within the AZE, from which one should be upstream and one downstream with respect to the direction of the residual current, and the other should be to one side of the farm in a direction orthogonal to the residual current
- Three should be 25m outside the AZE from which one should be upstream and one downstream with respect to the direction of the residual current, and the other should be to one side of the farm in a direction orthogonal to the residual current
- One from a reference site 500-1000m from the farm, in similar water depth and substratum type (where this exists)

2. Calculation of percent fines in feed

Guideline for determination of dust in fish feed which has a diameter of 3 mm or more

Introduction

This method determines dust in finished product of fish feed which has a diameter of 3 mm or more. The amount of dust and fragments can be determined when the feed is delivered to the farming site, or when the feed leaves a feeding device. The analytical procedure to determine dust will, in both cases, be the same. However, the sampling of the feed will differ.

Procedure

The sample of feed should be put through a sieve with a maximum sieve opening of

- a) 1 mm when the particle diameter is equal to 5 mm or less
- b) 2.36 mm when the particle diameter is more than 5 mm

The test could either be performed by use of a sieving machine or by a manually test.

Manually test

1. Put the accumulation box and the sieves on top of each other, with the accumulation box on the lowest part, then the smallest sieve and the biggest on top
2. Place the sieves on the balance and tare it.
3. Weigh at least 300 g of the feed on the upper sieve, note the weight, m0
4. Put on the lid
5. Sieve the feed smoothly and carefully for about 30 seconds
6. Remove the lid and weigh what is left in the accumulation box
7. Use a brush to remove all the particles from the sieves
8. The feed particles which have passed through all sieves are called dust (ms)
9. If the feed is fatty, or if dust is unevenly distributed, two replicates must be taken

Sifting machine

1. Put the accumulation box and the sieves on top of each other, with the accumulation box at the bottom and the biggest sieve on top
2. Place the sieves on the balance and tare it
3. Weigh at least 300 g of feed on the upper sieve, note the weight (m0)
4. Place the sieves on the sifting machine and then close the cover properly
5. Press the "START" button by holding it for 2-3 seconds, and then run the machine twice (2 x 1 min)
6. Remove the sieves and weigh what is left in the accumulation box
7. The feed particles which have passed through all sieves are called dust (ms)

Calculations

- Weight of feed before sieving = **m0**
- Weight of feed that has passed through all sieves = **md**

$$\text{Dust \%} = (\text{md} / \text{m0}) \times 100$$

Sampling

Feed delivered to the farming site:

Sampling of feed lots - delivered as material in bulk, big bags or small bags – should, at a minimum, be sampled as follows:

- Cut minimum 6 increment samples from the lot, evenly distributed throughout the lot
- Each increment sample should have a mass of ca. 500 grams
- Make a pooled sample from all the increment samples and be sure to use all sampled material (i.e., around 6 kg)
- Reduce the pooled sample to one analysis sample (for testing), each of ca. 500 grams

Feed leaving a feeding device:

Sampling of feed lots – leaving a feeding device - should as a minimum be sampled as follows:

- Sample minimum 6 samples from the feeding device. If there are multiple outlets of the feeding device (different cages or production units), sample at least two units / feeding device outlets.
- Each sample should have a mass of minimum 500 grams.
- Make a pooled sample from all the samples. Use all sampled material, i.e. around 6 kg.
- Reduce the pooled sample to one analysis sample (for testing), each of ca. 500 grams.

Practical advice / hint:

Depending on the type of feeding equipment used, it can be challenging to collect a representative feed sample. This often is the case where the feed leaves the feeding device with high speed (example.g., in feeding devices with high air velocity). In such cases, the feed can be collected by using a large, soft cloth to collect the feed. A soft cloth will not break the pellet and, at the same time, will retard the speed of the pellet in a gentle way.

Appendix II: Area-based management scheme

Participation in an effective area-based scheme for managing disease and resistance to treatments is required under the SAD standards. This appendix outlines the main components of the area-based management scheme that the SAD standards require under Criterion 3.1 and 5.4.

Participation in an effective area-based management scheme⁷⁷ for managing disease and resistance to treatments is a core component of the SAD standards. Area-based management supports a better understanding of, and ability to manage for, cumulative impacts at an ecosystem level.

Definition of “area”

In order to be considered as applicable under the SAD standard, the ABM scheme used by a farm must be applied over a given area. If area-based management is a regulatory requirement of the jurisdiction, then farms can define “area” as it is defined by regulation. In areas where ABM is not a regulatory requirement, the area covered under the ABM must be defined. The SC is still developing detailed guidelines for how area is defined. Those guidelines will likely define an area as, for example, a fjord or a collection of fjords that are ecologically connected. The boundaries of an area should be defined taking into account the zone in which key cumulative impacts on wild populations may occur, as well as water movement and other relevant aspects of ecosystem structure and function. Within the defined area, all farms need to be participating in the area based management scheme, even if not all farms are seeking certification under this standard.

ABM components and guidance

In order to be considered as applicable under the SAD standard, the ABM scheme used by a farm must ensure that there is

- Clear documentation of the farms/companies included in the ABM, contact people (including contact information) and mechanisms for communication
- Information and data-sharing among farms of any data needed to ensure coordination

The ABM scheme must include coordination among farms as relates to

- Application and rotation of treatments: farmers must be able to demonstrate a coordinated treatment plan and evidence that the schedule and rotation of treatments are being implemented (e.g., records, and empty containers). Where applicable, treatments and/or strategic harvesting of salmon is coordinated prior to outmigration.
- Stocking: records must demonstrate that all stocked fish are of the same year class and stocking dates were coordinated with other farms.
- Transport: farms must provide evidence (e.g., name of boat) that only closed wellboats are utilized for the transport of fish and there is no movement of stocked net cages. The SC is considering also requiring documentation of routes of travel.
- Production levels: on-farm and area farm density must be based on biological and geographical factors

⁷⁷ For more information on the principles of place-based, or area based management, see Young et. al 2007. Solving the Crisis in Ocean Governance: Place-Based Management of Marine Ecosystems. Environment: Volume 49, Number 4, pages 20–32

in the farming area. A rationale for on-farm and farm area density must be available for the auditor.

- Fallowing: Coordination of fallowing to help break disease cycles
- Monitoring schemes:
 - On-farm disease and pathogen monitoring and information sharing among farms
 - On-farm resistance monitoring and information sharing among farms
 - Commitment to collaborate on research on impacts on wild stocks, as specified under 3.1.3, may include monitoring that can be incorporated into the ABM
 - For farms located in areas where there are wild salmonids, monitoring of wild fish sea lice levels must be in place and be developed in collaboration with wild fish biologists. Monitoring is intended to inform the relationship between on-farm sea lice, farm management actions and sea lice infection levels on wild fish. Monitoring data may eventually be used to establish the relationship between x lice per farmed fish and y lice per wild fish. Given these goals, wild fish monitoring must include
 - Stratified sampling of wild fish by exposure to farms - before vs, after migrating past farms or near vs. far
 - Include reference areas without farms (where possible) to establish natural baseline levels of lice on wild juvenile fish (not necessary every year as part of monitoring but some basic understanding of this is required)
 - Establishment of background levels of sea lice via pre-siting studies or acceptable reference site comparisons for existing sites
 - Feedback loop to farms related to the effectiveness of the ABM scheme in order to allow farm managers and researcher to improve and adapt the ABM scheme

Appendix III: Cumulative impact assessment for disease and parasites

Under 3.1.2, the SAD standards require farms to undertake a cumulative impact assessment in relation to disease and parasites. Below is a summary of the necessary components of this assessment. The assessment can be undertaken as part of the ABM scheme or independently. Work undertaken in relation to the cumulative impact assessment can also be combined into the same study as is undertaken to document potential impacts on habitats and species as outlined in Criteria 2.4.

This information can come from an EIA or any other credible process of environmental and social assessment performed by a capable third party accredited by the relevant national authority or regulator. It is expected that wild fish biologists with relevant expertise will contribute to the assessment. In some instances, the assessment must include specific recommendations for mitigating impacts, as well as a timeframe for implementing those mitigation steps.

This information is required for new and existing farms. If an existing farm has only some of the required information from a previous study, it will need to commission a new assessment to fill in the gaps of information that it does not have. If there have been changes made to an existing farm, a new assessment will be needed to review the pertinent sections of the assessment.

Components of the cumulative impact assessment

Within each area, as defined under the ABM, an assessment of key regional, cumulative impacts of the farm and its neighbors, including an analysis of the appropriate density and infection pressure risk on wild populations, is required.

The cumulative impact assessment intends to ensure a credible third party has analyzed the key cumulative disease impacts of the farm and its neighbors. The specific components of the assessment represent the basic information that a farm must know about its impact on the surrounding environment. The cumulative impact assessment must include, at a minimum, the following information:

- Potential impacts on wild species: documentation on key wild species within the marine environment
- Presence of and proximity to wild salmonids: farms must document the presence or absence of salmonid species that migrate near their farm and within the area covered under the ABM and, where salmonids are present, the cumulative impact assessment must include all of the following
 - information that defines the approximate health of those populations (at the broadest level)
 - the relative density of wild salmon in the farming area
 - the known and possible migration routes near the farming area and the likely size of smolts during outmigration
- Farm and farm area density: the assessment must be able to provide a scientifically credible rationale for the farm's production density and provide information on how the approximate carrying capacity of the farming region as well as the presence and density of other farms was considered in determining the farm's density
- Sea lice infection pressure risk: based on the information gathered in the above components, farms, working with third-party wild fish scientists, must be able to present an analysis of their likely infection pressure based on the following factors: farmed fish at the farm and area level, average number of sea lice per fish, area and timing of potential interactions with wild salmon, and size and density of smolts migrating adjacent to the farm. Background levels needed to calculate infection pressure risk may come

from work done under 3.1.6 related to wild salmonid monitoring. A formula will need to be developed for this calculation.

Appendix IV: Feed resource calculations and methodologies

1. Forage Fish Dependency Ratio calculation

Feed Fish Dependency Ratio (FFDR) is the quantity of wild fish used per quantity of cultured fish produced. This measure can be weighted for fish meal or fish oil, whichever component creates a larger burden of wild fish in feed. In the case of salmon currently, the fish oil will be the determining factor for the FFDR in most cases. The dependency on wild forage fish resources should be calculated for both FM and FO using the formulas noted below. This formula calculates the dependency of a single site on wild forage fish resources, independent of any other farm.

$$FFDR_m = \frac{(\% \text{ fishmeal in feed from forage fisheries}) \times (\text{eFCR})}{22.2}$$

$$FFDR_o = \frac{(\% \text{ Fish oil in feed from forage fisheries}) \times (\text{eFCR})}{5.0}$$

Where:

- Economic Feed Conversion Ratio (eFCR) is the quantity of feed used to produce the quantity of fish harvested.

$$eFCR = \frac{\text{Feed, kg or mt}}{\text{Net aquacultural production, kg or mt (wet weight)}}$$

- The percentage of fishmeal and fish oil excludes fishmeal and fish oil derived from fisheries byproducts.⁷⁸ Only fishmeal and fish oil that is derived directly from a pelagic fishery (e.g. anchoveta) is to be included in the calculation of FFDR. Fishmeal and fish oil derived from fisheries byproducts (e.g., trimmings and offal) should not be included because the FFDR is intended to be a calculation of direct dependency on wild fisheries.
- The amount of fishmeal in the diet is calculated back to live fish weight by using a yield of 22.2%. This is an assumed average yield. If a different yield is used, documentation must be provided.
- The amount of fish oil in the diet is calculated back to live fish weight by using a yield of 5%. This is an assumed average yield. If a different yield is used, documentation must be provided.

⁷⁸ Trimmings are defined as by-products when fish are processed for human consumption or if whole fish is rejected for use of human consumption because the quality at the time of landing do not meet official regulations with regard to fish suitable for human consumption.

Fishmeal and fish oil that are produced from trimmings can be excluded from the calculation as long as the origin of the trimmings do not come from any species that are classified as critically endangered, endangered, or vulnerable in the IUCN Red List of Threatened Species (<http://www.iucnredlist.org/static/introduction>).

- FFDR is calculated for the grow-out period in the sea as long as the smolt phase does not go past 200 g. If the smolt phase goes past 200g then FFDR is calculated based on FFDR is calculated based on all feed used from 200 grams and onwards.

2. Fish Protein Index calculation

The Fish Protein Index (FPI) is the ratio of fish protein in the salmon compared to the protein from forage fish used to produce the salmon. If the use of protein from forage fish is less than the amount of protein produced as salmon, then FPI will be greater than 1 (or 100%). It should be calculated using the following formula.

$$\text{FPI} = \frac{\text{Protein in salmon (grams)}}{(\text{grams of fishmeal from forage fisheries in feed}) * (68\%) * \text{eFCR}}$$

Where:

- Protein in salmon (whole fish) as grams. The protein content in salmon is for practical purposes in this context stable and can be set to 18% (180 grams of protein per kg salmon).
- Grams of fishmeal from forage fisheries per kg feed = (grams fishmeal per kg feed in diet) - (grams of fishmeal from trimmings per kg feed in diet).⁷⁹
- 68% is the average protein content of fishmeal.⁸⁰
- eFCR is the economic FCR related to the site of production (defined in the same way as for the FFDR calculation).

Example calculation

A farm has produced a batch of salmon with an economic FCR of 1.2. The average fishmeal content in all feeds used to produce the salmon is 30% and the feed producer can demonstrate that 10% of the fishmeal used in the feed originates from trimmings. Therefore, the amount of fishmeal in the diet is 300 grams per kg feed. 10% of this originates from trimmings and can be deducted, which means that the use of fishmeal from trimmings is 30 grams, meaning that 270 grams of fishmeal in the diet originates from forage fisheries.

The calculation will then be

$$\text{FPI} = \frac{180}{(270) * (0.68) * 1.2} = 0.82, \text{ or expressed as percentage } 82\%$$

⁷⁹ Trimmings are defined as by-products when fish are processed for human consumption or if whole fish is rejected for use of human consumption because the quality at the time of landing do not meet official regulations with regard to fish suitable for human consumption. Fishmeal and fish oil that are produced from trimmings can be excluded from the calculation as long as the origin of the trimmings do not come from any species that are classified as critically endangered, endangered or vulnerable in the IUCN Red List of Threatened Species (The International Union for the Conservation of Nature reference can be found at <http://www.iucnredlist.org/static/introduction>).

⁸⁰ The content of fishmeal is set at 68%. If a higher percentage is used, the information must come from a credible source and documentation must be provided.

3. Explanation of FishSource scoring

FishSource scores provide a rough guide to how a fishery stacks up against existing definitions and measures of sustainability. The FishSource scores currently only cover five criteria of sustainability, whereas a full assessment – such as that by the Marine Stewardship Council (MSC) – will typically cover more than 60. As such, the FishSource scores are not a firm guide to how a fishery will perform overall. Nonetheless, the FishSource scores do capture the main outcome-based measures of sustainability.

FishSource scores are based on common measures of sustainability, as used by International Council for the Exploration of the Seas, the National Marine Fisheries Service and the MSC, among others (e.g., current fishing mortality relative to the fishing mortality target reference point, or current adult fish biomass relative to B_{msy}).

Components of the FishSource score

Issue	Measure	Underlying Ratio
Is the management strategy precautionary?	Determine whether harvest rates are reduced at low stock levels	$F_{advised}/F_{target\ reference\ point}$ or $F_{actual}/F_{target\ reference\ point}$
Do managers follow scientific advice?	Determine whether the catch limits set by managers are in line with the advice in the stock assessment	Set TAC / Advised TAC
Do fishers comply?	Determine whether the actual catches are in line with the catch limits set by managers	Actual Catch / Set TAC
Is the fish stock healthy?	Determine if current biomass is at long-term target levels	SSB/ B_{40} (or equivalent)
Will the fish stock be healthy in future?	Determine if current fishing mortality is at the long term target level	$F/F_{target\ reference\ point}$

If existing measures of sustainability consider a fishery to be relatively well-managed, then it will typically score 8 or more out of 10 on FishSource. If the fishery is judged to be doing okay, but requires improvement, then it will typically score between 6 and 8 on FishSource. A fishery falling short of minimum requirements of existing measures of sustainability is scored 6 or below, with the score declining as the condition of the fishery deteriorates.

The key relation between the MSC scoring system and FishSource scores is “80<->8”. For example, a FishSource score of 8 or above would mean an unconditioned passing for that particular aspect on the MSC system. Sustainable Fisheries Partnership devised scores in a way that, departing from 8, a score of 6 relates to a score of 60, and below 6, an MSC “below 60”, “no-pass” condition. Please note however that the MSC criteria have been interpreted through time with a substantial degree of variability among fisheries.

More information on FishSource is available at www.fishsource.org and an overview of the FishSource indices is available at http://www.fishsource.org/indices_overview.pdf.

About scoring and availability of product meeting a minimum score

A typical full assessment of a fishery through the MSC will include significantly more areas/criteria assessed than through FishSource, typically including more than 60 sustainability criteria. A fishery is deemed sustainable by the MSC if it scores 60 or more in every performance indicator, and an average of 80 or more at the principle

level. The MSC requires certified fisheries to take corrective actions to improve any areas of the fishery that scored between 60 and 80, with the intention of achieving a score of 80 or above in every area of the fishery.

As of March 2010, only one of 22 forage fisheries assessed by FishSource meets a minimum FishSource score of 8 in all score categories: herring (Norwegian spring spawner) with a total 2007 catch of 1267 thousand mt, which is equivalent to 8% of the total catch of those 22 forage fisheries of 14360 thousand mt.

11 of the 22 assessed forage fisheries meet a minimum FishSource score of 6 with a maximum of one n/a and no n/a in the biomass sustainability score category, with a catch volume of 9632 thousand mt in 2007.

4 of the 22 assessed forage fisheries meet a minimum FishSource score of 6 with a maximum of one n/a and a minimum score of 8 in the biomass sustainability score category, with a catch volume of 1444 thousand mt in 2007.

Appendix V: Energy records and assessment

Under Criterion 4.6, producers must collect data related to energy use and GHG emissions. According to recognized methods and standards, records must be provided showing the quantity and type of energy used on farm. At least once a year an assessment must be done in order to evaluate energy savings. In the second draft of the standard, the SAD will include in this appendix a list of the types of records required and/or a list of “recognized methods” for collecting this information and calculating GHG emissions.