



# Revised Recommendations for Indicator 3.1.7 of the ASC Salmon Standard (after public consultation, March – April 2021)

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## Background

*This document details the revised recommendations from the Sea Lice Technical Group after assessing the feedback received from the first public consultation that occurred between March and April 2021 and from the Technical Consultation Group in November 2021.*

Indicator 3.1.7 of the current ASC Salmon Standard (v 1.3) deals with “maximum on-farm lice levels during sensitive periods for wild salmonids”. With the support of a Technical Working Group composed of a (core) Technical Group (TG) and a (wider) Technical Consultation Group (TCG), ASC is reviewing and revising this indicator ensuring that it is set at an accurate level and reflects best practice within the global salmon industry. The scope of the revision includes four specific aspects:

- A. Sea lice species/life stage/gender for which to set a metric.
- B. Requirements for non-sensitive periods.
- C. Requirements on sea lice sampling protocols.
- D. Regional approaches for setting on-farm sea lice levels.

TG recommendations for a revised indicator for aspects A, B and C and several core elements of a recommended approach for aspect D were presented for a first public consultation between March and April 2021. Similarly, the revised recommendations after the public consultation were presented for feedback to the TCG in November 2021. This document explains the revised recommendations from the TG after assessing the feedback received from those two processes.

### **A. Sea lice species/life stage/gender for which to set a metric**

The current Indicator 3.1.7 sets a maximum mature female lice (*Lepeophtheirus salmonis*) level per fish. In practice, country or region/jurisdiction-specific regulatory requirements on maximum lice levels differ according to local circumstances and ecosystems and are set for either the number of adult female lice or the number of mobile adult lice. In its implementation of the Salmon Standard to date, ASC has deferred to these local circumstances in three regions (British Columbia - Canada, the Faroe Islands, and Norway) by allowing Variance Requests<sup>1</sup>.

Within its deliberation, the TG explored the justification for focusing on other species besides *Lepeophtheirus salmonis* and determined that *Caligus clemensi* in British Columbia (BC), Canada, merits attention, since it shows up significantly on wild fish, including juvenile wild salmonids. The TG wanted to understand better the interplay between wild and farmed fish. Data and research reviewed show that in some years and/or for certain areas of BC, the generalist *C. clemensi* has higher abundances in wild fish and farmed salmon than *L. salmonis*, suggesting differences in host specificity and transmission dynamics between the two sea lice species. The transmission dynamics of *C. clemensi* among farmed salmon and wild fish, including wild juvenile salmon, are not well documented (see Appendix 1 - Technical Note: Lice species for which to set a metric).

This situation in BC is unique, given the specific concerns around out-migrating wild salmonids. The TG did not believe that a similar focus on *Caligus* species in other regions with wild salmonids would improve management decisions related to the farms' impact on wild fish. In BC, however, a revised recommended indicator requiring farms in BC to report *Caligus* spp would generate a stream of data that is comparable and provide insight for farm management. The data generated by the revised

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<sup>1</sup> A Variance Request is a request to adapt an ASC indicator/performance level to a unique local circumstance that the ASC Standard(s), being global, were not able to, for whatever reason, foresee during the Standard Setting Process. See [VR 88](#), [VR 141](#), [VR 227](#), and [VR 279](#).

recommended Indicator will provide the basis for future revisions of the requirement aiming to decide whether lice management strategies should further consider *C. clemensi*.

### **Recommendation for a revised indicator**

- 1) To include a requirement to publicly report *Caligus* spp. on farms in British Columbia, BC, Canada within 7 days of sampling.

#### **Notes:**

- The TG did not find sufficient scientific research to determine a specific on-farm *C. clemensi* limit in BC.
- Regarding the issue of which life stage/gender of sea lice, see the suggested sampling approach in aspect C below.

## **B. Requirements for non-sensitive periods**

The current Indicator 3.1.7 of the ASC Salmon Standard (v 1.3) requires farms located in areas of wild salmonids to comply with a maximum on-farm sea lice during the sensitive periods for wild salmonids<sup>2</sup>. The standard does not include sea lice level requirements outside of that sensitive period.

The TG acknowledged that most jurisdictions have maximum sea lice limits for sensitive and non-sensitive periods and that the length of the defined sensitive period varies. The TG identified three reasons to have limits during non-sensitive periods:

- 1) Presence of wild salmonids species that stay near shore (e.g., sea trout and chinook salmon);
- 2) Avoiding uncontrollable sea lice outbreaks; and
- 3) Preparing for sensitive periods.

The TG agreed that a balance is needed to be found between seeking lower lice levels year-round, prioritising the specific periods when juveniles are present and avoiding pressure on resistance development through repeated and more frequent treatments. A recently published research paper<sup>3</sup> showed that, in Norway, an increase in sea lice tolerance coincided with an increasing use of medicines in the period 2000–2015, while sensitivity slowly increased as the use of medicines decreased in subsequent years.

Because of concerns around resistance (also addressed in a separate set of requirements in the current ASC Salmon Standard<sup>4</sup>), the TG was reluctant to recommend setting additional requirements for managing sea lice during non-sensitive periods. In the context of the issues of avoiding uncontrollable sea lice outbreaks and preparing for sensitive periods, the TG viewed these decisions as mainly farm-management decisions that had little connection to wild salmonids.

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<sup>2</sup> The current ASC Salmon Standard (v1.3) state that “Sensitive periods for migrating salmonids are during juvenile outmigration and approximately one month before”.

<sup>3</sup> Myhre Jensen E, Horsberg TE, Sevatdal S, Helgesen KO (2020). Trends in de-lousing of Norwegian farmed salmon from 2000–2019— Consumption of medicines, salmon louse resistance and non-medicinal control methods. PLoS ONE 15(10): e0240894.

<sup>4</sup> **Indicator 5.3.1** Bio-assay analysis to determine resistance when two applications of a treatment have not produced the expected effect.

**Indicator 5.3.2** When bio-assay tests determine resistance is forming, use of an alternative, permitted treatment, or an immediate harvest of all fish on the site.

**Indicator 5.3.3** Specific rotation, providing that the farm has >1 effective medicinal treatment product available, every third treatment must belong to a different family of drugs.

The presence of wild salmonids species that stay near shore would be the one potentially compelling reason to develop year-round requirements regarding lice levels. The TG heard concerns about those species from stakeholders, in particular concerns about the adequacy of regulations in some of the jurisdictions. After careful consideration, TG members concluded that they were not inclined to make a special non-sensitive period requirement for all jurisdictions given the varying lengths of the existing sensitive period and that some jurisdictions will likely be updating their regulations in the coming years, which ASC will be tracking (and adopting as per the regional approaches to the indicator recommended on aspect D below). Setting non-sensitive period requirements present a trade-off between being protective of wild salmonids species' year-round sea lice exposure, enhancing protections when juveniles are present, and avoiding additional treatments on farmed fish and the associated risks of developing resistance or other negative effects. Furthermore, the TG acknowledge that most jurisdictions have maximum sea lice limits for non-sensitive periods set by regulators. In weighing this balance, the TG recognised that value judgements, in addition to technical analysis, come into play. Given all these variables, the TG recommends maintaining a system that emphasises a sensitive period focused around the presence of juveniles and does not incentivise treatments year-round.

### ***Recommendation for a revised indicator***

- 1) To maintain the indicator's focus on sensitive periods.

## **C. Requirements on sampling protocols**

Indicator 3.1.4 of the current ASC Salmon Standard (v 1.3) requires weekly on-farm testing<sup>5</sup> for sea lice during and immediately prior to sensitive periods for wild salmonids. Testing must be at least monthly during the rest of the year.

The TG acknowledged that most jurisdictions have specific requirements on sea lice sampling set by regulators (on the frequency and the sampling protocol to follow) and that these vary across regions according to the period (sensitive or non-sensitive period), water temperature, and the number of cages and fish to be sampled.

In this context, the TG examined the sampling protocols and data from different jurisdictions and ASC databases and found a lack of consistency when comparing sea lice levels between farms and regions and when evaluating the effectiveness of sea lice management strategies. To address this, the TG developed a recommended set of requirements for sea lice sampling to improve the consistency of data collection and its utility for meaningful statistical analysis and reporting. From a statistical standpoint, the TG reviewed research that showed sampling "few fish from many cages" resulted in a marked improvement in precision when sampling aquatic one-host parasites in cage-based production systems<sup>6</sup>. In addition, the TG agreed that fish welfare should be a consideration when setting sampling protocol requirements.

The key components of the recommended requirements for sea lice sampling protocols are (1) frequency, (2) number of cages, (3) number of fish per cage and (4) sea lice stages. The TG also recommended that (5) under certain circumstances detrimental to the fish health and welfare, farms

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<sup>5</sup> Testing includes both counting and identifying sea lice. The method must follow national or international norms, follows accepted minimum sample size, use random sampling, and record the species and life-stage of the sea lice.

<sup>6</sup> [Revie CW, Hollinger E, Gettinby G, Lees F, Heuch PA \(2007\). Clustering of parasites within cages on Scottish and Norwegian salmon farms: Alternative sampling strategies illustrated using simulation. Preventive Veterinary Medicine 81 \(2007\) 135–147](#)

should be exempt with respect to the requirement for sampling, this being under the direction of the professional responsible for the health and welfare of the farmed fish.

Regarding the frequency, a weekly sampling frequency during the sensitive period supports on-farm decision-making and provides time to react if the sea lice population is rising. Immediately prior to the sensitive period, a farm needs to demonstrate it is entering the sensitive period below its established sea lice limit.

In relation to the number of cages and number of fish per cage, there is variation in the size and design of farms. Therefore, sampling a proportion of cages, rather than a set number of cages, would take into consideration this variation. The TG believed that sampling at least 50% of cages over a 2-week period, with the entire farm sampled over at least a 6-week period, seemed reasonable and would give farms a window into the state of individual cages, particularly if a treatment intervention could be applied to one or a number of cages and not to the whole farm. At least 10 fish per cage should be sampled. The TG saw this recommended sampling protocol as supplementary to current local regulations and not in contradiction to them.

With regards to the sea lice stages for which to provide sampling data, the TG recommended that farms collect a baseline of information on different stages of sea lice, regardless of the specific stage that the farm's jurisdiction might require. Specifically, the TG recommends that farms provide data on the number of mobiles<sup>7</sup> and the number of adult females<sup>8</sup>.

Finally, the TG recognised that under certain circumstances, such as harmful environmental conditions and recently stocked fish, sampling can jeopardise farmed fish health and welfare. The professional responsible for the health and welfare of the farmed fish is best suited to make decisions on whether to sample under those circumstances.

### ***Recommendation for a revised indicator***

#### **1) Frequency:**

- a) Maintain the current weekly sampling requirement during the sensitive period and monthly sampling during the rest of the year.
- b) Remove reference to having to conduct weekly sampling immediately prior to sensitive periods (footnote 43 of the Salmon Standard<sup>9</sup>) and further revise to read: "Farms shall conduct sampling during the month prior to the sensitive period for the purpose of achieving sea lice levels that do not exceed the sea lice limit at the time of the first sampling event within the sensitive period."

2) Number of cages: At least 50% of cages should be sampled over a 2-week period, with the entire farm sampled over at least a 6-week period.

3) Number of fish per cage: A minimum of 10 fish per cage should be sampled.

4) Sea lice stages: At a minimum provide data on mobiles and adult females

5) Fish welfare (exemption from sampling): The professional responsible for the health and welfare can exempt fish from being sampled during a certain period of time within the sensitive period if local regulations permit. The reason for the exemption shall be documented. Grounds for exemption may include:

- Immediately after smolting and stocking.

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<sup>7</sup> Pre-adult and adult sea lice males. Motile is considered a synonym of mobile.

<sup>8</sup> The TG also considered requiring counting of juvenile sea lice, though had concerns about the practicality of it.

<sup>9</sup> ASC Salmon Standard v 1.3, Footnote 43: Testing must be weekly during and immediately prior to sensitive periods for wild salmonids, such as outmigration of wild juvenile salmon. Testing must be at least monthly during the rest of the year, unless water temperature is so cold that it would jeopardise farmed fish health to test for lice (below 4 degrees C). Within closed production systems, alternative methods for monitoring sea lice, such as video monitoring, may be used.

- Fish health – undergoing a disease event and/or being treated (including treatment for sea lice). In case the reason for the exemption is related to fish treatment, the maximum duration for the exemption shall be 2 weeks.
- During specific environmental events – water temperature (i.e., below 4 °C)<sup>10</sup>, low oxygen, plankton event.

Note on the applicability of this recommendation: The sampling requirements apply only to farms in jurisdictions with wild salmonids, as per the scope (for areas with presence of wild salmonids) of the recommended revised indicator.

#### **D. Regional approaches to the indicator (during the sensitive period)**

The TG acknowledged a clear rationale for setting sea lice limits on a regional scale. Regional variability result from environmental and biological differences across jurisdictions, including the differences in wild salmonids species, lice species and sub-species, host profiles<sup>11</sup>, water temperatures, as well as the wide diversity around the length set for sensitive periods and the complexity of interactions occurring in various different regional ecosystems.

##### ***Setting a regionally relevant lice level and sensitive period***

The TG acknowledged that the ASC rationale for setting the current Salmon Standard requirement on maximum level of 0.1 mature female sea lice in Indicator 3.1.7 followed a precautionary approach on keeping lice levels near zero during the sensitive period. When first established, the 0.1 limit did not have a scientific justification to support that specific level. In addition, TG members noted that counting accuracy at such a low level is extremely difficult even with large sample sizes, which could lead to errors and management actions based on unreliable information.

In practice, ASC has not implemented the 0.1 sea lice limit globally as farms in three jurisdictions have applied for, and received, variance requests to comply instead with their local regulatory requirements (see [footnote 1](#)).

The TG also noted that there is no globally agreed “silver bullet” level for precautionary maximum lice levels on farms, nor is there a globally relevant length for sensitive periods. On this basis, the TG concluded the following guiding ideas for a recommendation:

- 1) ASC should implement regionally relevant sea lice limits on farms, as well as regionally (or locally) relevant sensitive periods.
- 2) The regionally relevant sea lice limit should be set to minimise infection risks for juvenile wild salmonids. The TG notes that juvenile wild salmonids are the most vulnerable in terms of immune capacity. The TG also acknowledges the existence of wild salmonids species that stay near shore as adult fish (see Aspect B). However, the TG believes that the focus of sensitive period and the sea lice limits during those periods should be when salmonids are at their most vulnerable stage.
- 3) The TG recommends an approach that results in significant consequences for farms that go over the limit and are unable to bring sea lice levels down within a reasonable time frame.

<sup>10</sup> In line with exemption in the current ASC Salmon Standard v1.3.

<sup>11</sup> [Torrissen, O., Jones, S., Asche, F., Guttormsen, A., Skilbrei, O.T., Nilsen, F., Horsberg, T.E., Jackson, D. \(2013\). Salmon lice – impact on wild salmonids and salmon aquaculture. J. Fish Dis. 36, 171–194.](#)

Specifically, a farm should be unable to sell the fish as ASC certified if the farm exceeds the sea lice limit for more than a specified time limit<sup>12</sup>.

- 4) As a starting place, the TG recommends that the ASC's sea lice limits reflect the lowest current action/trigger limits used by the different regions. Similarly, ASC's sensitive periods should reflect the periods used by those regions. The TG does not currently have sufficient evidence to set a different regional limit or sensitive period. However, it encourages ASC to be open to compelling evidence to adjust its regional limits and sensitive periods, as well as react immediately to new information and requirements emerging from regulatory updates underway in jurisdictions such as Scotland and BC (see footnotes 15 and 16).

Based on these guiding ideas, the TG recommends a revision that includes the following elements:

- ASC sets regionally relevant sea lice limits and sensitive periods:
  - As a starting place:
    - ASC uses the lowest sea lice limit established in the different regions today (established either by the regulators or through an industry code of practice, whichever is lower) as the ASC Sea Lice Thresholds.
    - ASC uses the sensitive period established in the different regions today (established either by the regulators or through an industry code of practice, whichever is longer).
  - ASC should remain open to evidence that would compel it to change these limits and periods and be attentive to the results of regulatory updates.
  - In situations where there are no limits nor sensitive period established, ASC will require the use of the most rigorous sea lice limit in effect at that point in time (e.g., 0.2 adult female) and a sensitive period that reflects evidence of the time during which juvenile salmonids are present, using the latest knowledge.
  - ASC should annually review sea lice limits in the different regions and update its sea lice thresholds accordingly.
- A farm will become non-conforming if it fails to maintain sea lice levels below the ASC Sea Lice Thresholds:
  - The farm needs to inform its Conformity Assessment Body (CAB) of the exceedance.
  - If the farm fails to bring sea lice levels below the thresholds within a certain timeline (see below), the farm shall not sell the fish as ASC certified. This consequence – not being able to sell the fish as ASC-certified – is one of the most severe consequences possible under the ASC certification scheme and it is more severe than most local regulations, which require management actions when a trigger is reached, but not necessarily severe actions (such as immediate harvest).
    - Some situations would justify an exemption to the strict timeline limit, such as specific environmental events (e.g., algal blooms), weather conditions, actions that could compromise fish welfare, unforeseen increases in on-farm lice levels, or documented logistical roadblocks or delays for implementing treatment.

Members of the TG had different views about the length of time a farm shall bring the sea lice level below the thresholds in case of an exceedance. A member suggested it should be zero days, while other members indicated farms need about 30 days to bring sea lice levels below the thresholds. The TG also analysed the option of 15 days. Some members also stated the fact that sea lice exceedance can occur suddenly. To assist in its deliberation, the TG looked at the current regulations in different

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<sup>12</sup> Mirroring the approach that ASC took on revising VR's [88](#) & [141](#)



jurisdictions<sup>13</sup> as well as data<sup>14</sup> that showed 94.3% of Norwegian farms stayed completely below the country's sea lice threshold during the established sensitive period in 2020 (i.e., zero days), and fewer than 1% of farms exceeded by more than 2 weeks. The TG did not have similar data compiled from other jurisdictions. When consulted, members of the TCG also had different views about the length of time a farm shall bring the sea lice level below the thresholds in case of an exceedance. One member suggested it should be 7 days while another recommended a window of 7 days and no more than 14 days. Another member suggested that the period should be as specified by the local authority and if not specified, default to 14 to 21 days noting that 14 days would be similar to the exempt period for sampling due to fish welfare concerns (see Aspect C). One member suggested 21 days and argued that the requirement should take into account the time required to arrange the equipment/medicine, to treat the site and for follow-up monitoring. In such instances, some allowance should be afforded operators as long as they can provide evidence of taking action to reduce their sea lice levels. Another member suggested 28 days.

The TG recommends seeking stakeholder feedback on a globally appropriate requirement for the length of time an exceedance should be permitted.

On a related issue, the TG would like to further explore a suggestion to include a requirement on the maximum number of times a farm can exceed the sea lice threshold during the sensitive period but acknowledge its needs more data from different jurisdictions to make a determination on that suggestion. The TG recommends ASC assess this suggestion in a future revision of the indicators around sea lice.

### ***Additional considerations on regionally relevant sea lice levels and sensitive periods***

To support its deliberations in the context of the recommendations for setting a regionally relevant sea lice level and sensitive period, the TG requested an independent evaluation<sup>15</sup> that asked several threshold questions around the regulatory process in each of the major salmon producer jurisdictions with wild salmonids (Canada, Faroe Is., Ireland, Norway and Scotland). The questions focused on how well data, research, and public input create a real impact on the outcomes of regulatory processes and in achieving its protection goal. In addition, the evaluation reviewed the level of transparency around the information provided by regulators.

The independent evaluation described concerns as well as showed that regions are proactively improving the robustness of their regulations, with a general trend towards increasing stakeholder involvement in regulatory processes. For example, in Canada, independent biologists, NGOs and First Nation rights-holders are now consulted and included in efforts to develop multi-stakeholder, area-based management systems for aquaculture in BC<sup>16</sup>. In Scotland, the government has recently committed to adopting a new management system for mitigating sea lice-induced risks to its wild salmonids populations<sup>17</sup> and is currently conducting an open public consultation on it "Proposals for a risk-based framework for managing interaction between sea lice from marine finfish farm

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<sup>13</sup>Currently, the only jurisdictions that specified a set time limit to reduce sea lice levels below the established threshold are BC, Canada (42 days upon discovery of the exceedance), and Scotland (within 4 consecutive weeks after reaching or exceeding the threshold).

<sup>14</sup> The dataset was obtained from BarentsWatch (<https://www.barentswatch.no/en/fishhealth/>).

<sup>15</sup>See report: Regulatory Processes for Setting Sensitive-Period and Sea-lice Thresholds in Major Salmon Producer Jurisdictions: An Evaluation. Irja Vormedal and Mari Lie Larsen. The Fridtjof Nansen Institute (FNI). November 2021.

<sup>16</sup><https://www.dfo-mpo.gc.ca/aquaculture/publications/amb-twg-eng.html>

<sup>17</sup><https://media.sepa.org.uk/media-releases/2021/protecting-scotlands-wild-atlantic-salmon-a-national-priority-as-protection-zones-and-sea-lice-thresholds-proposed-by-sepa.aspx>

developments and wild Atlantic salmon in Scotland”<sup>18</sup>. The Faroes Is. recently updated its sea lice regulation which now includes an established sensitive period<sup>19</sup>.

The evaluation confirmed the TG’s approach to using sea lice limits that reflect the lowest current action/trigger limits used by the different regions as starting place for ASC’s regionally relevant sea lice limits and sensitive periods. The TG believes ASC should revise these limits annually and update them based on:

- Changes in the local regulation.
- New evidence and knowledge that would compel it to change these limits and periods independently from the local regulatory process. The TG does not believe it has sufficient scientific evidence today to set a sea lice limit or sensitive period length that is different than the currently established in the different regions.

The exact starting place for ASC’s regional sea lice thresholds and sensitive periods currently would be:

Region/Jurisdiction	Sea Lice Thresholds ( <i>L. salmonis</i> )	Sensitive Period
Canada (British Columbia)	3 motile*	1 <sup>st</sup> March to 30 <sup>th</sup> June
Faroe Is.	0.5 adult female	1 <sup>st</sup> May to 31 <sup>st</sup> July
Ireland	0.3 ovigerous female	1 <sup>st</sup> March to 31 <sup>st</sup> May
Norway	0.2 adult female	– 13 <sup>th</sup> April to 24 <sup>th</sup> May (weeks 16-21) for Nord-Trøndelag and southwards – 18 <sup>th</sup> May to 28 <sup>th</sup> June (weeks 21-26) for Nordland, Troms and Finnmark
Scotland	0.5 adult female**	1 <sup>st</sup> February to 30 <sup>th</sup> June**

\*Motile includes adult *L. salmonis* females (with or without egg strings) and other motile *L. salmonis* (including adult males, and preadults). Motile is considered a synonym of mobile.

\*\*From the [Code of Good Practice for Scottish Finfish Aquaculture \(CoGP\)](#).

### **Area-Based Management (ABM) Scheme – Salmon Standard, Appendix II-1. Attributes and required components of the ABM:**

The TG recognised that setting sea lice limits on an ABM scale would be more aligned with the science behind wild salmonids interactions than the existing requirements on setting sea lice limits at an individual farm scale. To address this aspect, the TG reviewed the current requirements on ABM in the Salmon Standard (v 1.3):

- **Indicator 3.1.1** requires participation in an ABM scheme for managing disease and resistance to treatments that include coordination of stocking, fallowing, therapeutic treatments and information-sharing. Appendix II-1 of the Standard establishes the attributes and required components of the ABM.

<sup>18</sup><https://consultation.sepa.org.uk/regulatory-services/protection-of-wild-salmon/>

<sup>19</sup><https://logir.fo/Kunngerd/75-fra-28-06-2016-um-yvirvoku-og-talming-av-lusum-a-alifiski>

- **Indicator 3.1.3** requires the establishment and annual review of a maximum sea lice load for the entire ABM and for the individual farms. Appendix II-2 establishes the requirements for setting and revising ABM lice loads and on-farm lice levels<sup>20</sup>.
- **Indicator 3.1.6** requires, in areas of wild salmonids, monitoring of sea lice levels on wild out-migrating salmon juveniles or on coastal sea trout or Arctic char, with results made publicly available<sup>21</sup>.

According to Appendix II-2 (of the current ASC Salmon Standard v 1.3), for farms located in areas with wild salmonids, the ABM scheme shall demonstrate how the scheme is using the results of wild monitoring required by Indicator 3.1.6, to review and potentially revise the maximum lice load for the area each year and/or production cycle. Adjustments to the area's lice load would lead to corresponding limits on lice levels on individual farms. This feedback loop must be transparent and document how the ABM scheme is being protective of wild fish through the interpretation of wild monitoring data. If wild monitoring reveals that the on-farm sea lice limits are not being protective for wild populations, the farm must set a lower level in subsequent sensitive periods.

TG recommends clarifying the “feedback loop” that needs to happen after the ABM scheme assesses the results of wild monitoring required by Indicator 3.1.6:

- Outcomes of the review would include a final recommendation and justification for maintaining or adjusting maximum sea lice loads in an ABM scheme. The goal is that an actual review is done by the participants of the ABM scheme, and a recommendation is made based on all available information.
- Documentation of this review will be standardised, transparent, and include attendees, minutes, recommendations, actions and justification.

## E. Summary Table

Table 1 summarises the TG's recommendations for the revised indicator. The table includes the main areas of stakeholder's concern identified for the initial recommendations during past March-April 2021 consultation, the comments and further deliberations from the TG and the revised recommendations resulting from these deliberations.

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<sup>20</sup> According to Appendix II-2, an ABM scheme shall initially set this total load figure based on the regulatory obligations of the jurisdiction in which it operates and the results of any wild monitoring done to date. In practice, this would mean that farms in most ABM schemes would take the on-farm lice levels they are required to achieve by regulators and multiply them times the number of farmed fish in the area. This would be a starting place.

<sup>21</sup> If national or local regulations prohibit the handling of wild salmonids then it should be clear that wild populations are being monitored and protected in another way. Cooperation from the farm is necessary so it must be able to provide the data, but the farm is not expected to catch the salmon themselves. The farm could, for example, provide existing evidence to the CAB on how control agents are impacting wild populations.

Aspect	Recommendations	Main Areas of Stakeholders Concern from 1 <sup>st</sup> Public Consultation	TG's Comments & Further Deliberations	Revised Recommendations
<b>A. Sea lice species/life stage/gender for which to set a metric</b>	<p>1) To include a requirement to publicly report <i>Caligus</i> on farms in British Columbia, BC, Canada within 7 days of sampling.</p> <p><u>Rationale:</u></p> <ul style="list-style-type: none"> <li>• Within its deliberation, the TG explored the justification for focusing on other species besides <i>Lepeophtheirus salmonis</i> and determined that <i>Caligus clemensi</i> in British Columbia (BC), Canada, merits attention, since it shows up significantly on wild fish, including juvenile wild salmonids.</li> <li>• Data and research reviewed show that in some years and/or for certain areas of BC, the generalist <i>C. clemensi</i> has higher abundances in wild fish and farmed salmon than <i>L. salmonis</i>, suggesting differences in host specificity and transmission dynamics between the two sea lice species.</li> <li>• The TG believes that the transmission dynamics of <i>C. clemensi</i> among farmed salmon and wild fish, including wild juvenile salmon, are not well documented (See Appendix 1 - Technical Note: Lice species for which to set a metric).</li> <li>• The data generated by the revised recommended Indicator will provide the basis for future revisions of the Indicator aiming to decide whether lice management strategies should further consider <i>C. clemensi</i>.</li> </ul>	<ul style="list-style-type: none"> <li>• Data on <i>Caligus</i> in BC is already available. ASC should use it to determine a meaningful threshold for that species.</li> </ul>	<ul style="list-style-type: none"> <li>• The TG did not find sufficient scientific research to determine a specific on-farm <i>C. clemensi</i> level in BC, and notes that regulators in that jurisdiction have not done so either.</li> </ul>	N/A

Aspect	Recommendations	Main Areas of Stakeholders Concern from 1 <sup>st</sup> Public Consultation	TG's Comments & Further Deliberations	Revised Recommendations
<b>B. Requirements for non-sensitive periods</b>	<p>1) To maintain the indicator's focus on sensitive periods.</p> <p><u>Rationale:</u></p> <ul style="list-style-type: none"> <li>The TG agreed that a balance is needed to be found between seeking lower lice levels year-round, prioritising the specific periods when juveniles are present and avoiding the emergence of resistance through repeated and more frequent treatments.</li> <li>Because of concerns around resistance, the TG was reluctant to recommend setting additional requirements for managing sea lice during non-sensitive periods.</li> <li>Setting non-sensitive period requirements present a trade-off between being protective of sea trout's year-round lice exposure, versus incentivising additional treatments on farmed fish and the associated risks of developing resistance or other negative effects. In weighing this balance, the TG recognised that value judgements, in addition to technical analysis, come into play. Given all these variables, the TG concluded to defer to local regulators to set locally relevant requirements that would be protective of sea trout during non-sensitive periods.</li> </ul>	<ul style="list-style-type: none"> <li>A precautionary approach should be taken.</li> <li>Limits should be implemented during non-sensitive periods in jurisdictions where vulnerable juvenile fish are present in nearshore areas (e.g., chinook in the West Coast of Vancouver Island, sea trout in Norway and Scotland, etc.).</li> </ul>	<ul style="list-style-type: none"> <li>When considering wild fish species (e.g., sea trout, chinook salmon), the TG was hesitant to lose the distinction of a sensitive period and set year-round limits. The rationale for the review was to focus on sensitive periods, providing clarity as to the purpose of this aspect of the standard.</li> <li>The TG agreed to further explain the rationale of the above.</li> </ul>	<p><u>Revised Rationale:</u></p> <ul style="list-style-type: none"> <li>Setting non-sensitive period requirements present a trade-off between being protective of wild salmonids species' year-round sea lice exposure, enhancing protections when juveniles are present, and avoiding additional treatments on farmed fish and the associated risks of developing resistance or other negative effects.</li> <li>Furthermore, the TG acknowledge that most jurisdictions have maximum sea lice limits for non-sensitive periods set by regulators. In weighing this balance, the TG recognised that value judgements, in addition to technical analysis, come into play.</li> <li>Given all these variables, the TG recommends maintaining a system that emphasises a sensitive period focused around the presence of juveniles and does not incentivise treatments year-round.</li> </ul>

Aspect	Recommendations	Main Areas of Stakeholders Concern from 1 <sup>st</sup> Public Consultation	TG's Comments & Further Deliberations	Revised Recommendations
<b>C. Requirements on sampling protocols</b>	<p>1) <u>Frequency</u>:  a. Maintain the current weekly sampling requirement during the sensitive period.  b. Remove reference to having to conduct weekly sampling immediately prior to sensitive periods (footnote 43 of the Salmon Standard) and further revise to read: "Farms shall ensure that the lice levels are below the maximum sea lice limit at the time of the first sampling event within the sensitive period."</p> <p>2) <u>Number of cages</u>: At least 50% of cages should be sampled over a 2-week period.</p> <p>3) <u>Number of fish per cage</u>: A minimum of 10 fish per cage should be sampled.</p> <p>4) <u>Fish welfare (exemption from sampling)</u>: The veterinarian or fish health and welfare professional can exempt fish from being sampled during a certain period of time within the sensitive period, if local regulations permit. The reason for the exemption shall be documented.</p> <p><u>Rationale</u>:</p> <ul style="list-style-type: none"> <li>• The TG examined the sampling protocols that provided the best statistical results and agreed that creating a minimum informative sampling protocol requirement would address the challenges identified within the revision (i.e., lack of consistency when comparing lice levels between farms and regions and when evaluating the effectiveness of sea lice management strategies).</li> <li>• From a statistical standpoint, the TG reviewed research that showed sampling "few fish from many cages" resulted in a marked improvement in precision when sampling aquatic one-host parasites in cage-based production systems.</li> <li>• In addition, the TG agreed that fish welfare should be a consideration when setting sampling protocol requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• There does not appear to be a scientific justification for the sampling details around the number of cages and fish sampled.</li> <li>• Sampling such a low number of fish in a low proportion of cages seems to be a lower bar than the legal requirements in many jurisdictions.</li> <li>• The approach would be a burden at sites with many cages.</li> </ul>	<p>The TG agreed to:</p> <ul style="list-style-type: none"> <li>• Further explain the scientific rationale for the recommendation.</li> <li>• Name the sea lice stages required to be sampled.</li> </ul>	<ul style="list-style-type: none"> <li>• To maintain recommendations 1) Frequency; 3) Number of fish per cage and 4) Fish welfare (exemption from sampling) and to: <ul style="list-style-type: none"> <li>◦ Revise 2) <u>Number of cages</u>: At least 50% of cages should be sampled over a 2-week period, with the entire farm sampled over at least a 6-week period.</li> <li>◦ Add 5) <u>Sea lice stages</u>: At a minimum provide data on mobiles and adult females.</li> </ul> </li> <li>• To further revise reference in footnote 43 to read "Farms shall conduct sampling during the month prior to the sensitive period for the purpose of achieving sea lice levels below the sea lice limit at the time of the first sampling event within the sensitive period."</li> </ul> <p><u>Revised Rationale</u>:</p> <ul style="list-style-type: none"> <li>• The TG examined the sampling protocols and data from different jurisdictions and ASC databases and found a lack of consistency when comparing lice levels between farms and regions and when evaluating the effectiveness of sea lice management strategies.</li> <li>• To address this, the TG developed a proposed recommended set of requirements for sea lice sampling protocol to improve the consistency of data collection and its utility for meaningful statistical analysis and reporting.</li> <li>• In relation to the number of cages and number of fish per cage, there is variation in the size and design of farms. Therefore, sampling a proportion of cages, rather than a set number of cages, would take into consideration this variation.</li> </ul>

				<ul style="list-style-type: none"> <li>• The TG believed that sampling at least 50% of cages over a 2-week period, with the entire farm sampled over at least a 6-week period seemed reasonable and would give farms a window into the state of individual cages, particularly if a treatment intervention could be applied to one or a number of cages and not to the whole farm.</li> <li>• The TG saw this recommended protocol as supplementary to current local regulations and not in contradiction to them.</li> </ul>
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Aspect	Recommendations	Main Areas of Stakeholders Concern from 1 <sup>st</sup> Public Consultation	TG's Comments & Further Deliberations	Revised Recommendations
<b>D. Regional approaches to the indicator (during the sensitive period)</b>	<p><b>On setting a regionally relevant lice level:</b></p> <p>The TG is recommending a revision that includes the following elements:</p> <ol style="list-style-type: none"> <li>1) Rely on local regulators to define trigger levels and sensitive periods. <ul style="list-style-type: none"> <li>• In situations where there are no jurisdictional regulations to enforce, ASC will require the use of regulatory triggers and sensitive periods of the most similar jurisdiction based on the environment and species present.</li> <li>• In situations where significant concerns are raised about the fitness of local regulations to address wild salmonids, and more than one trigger level exist, ASC should use the lowest trigger level available in the jurisdiction's sensitive period (i.e., Scotland)</li> <li>• ASC should annually review trigger levels in the different jurisdictions and update its guidance to producers and auditors accordingly.</li> </ul> </li> <li>2) Be more protective than local regulators by having a farm become non-conforming with ASC if it surpasses that trigger level. Local regulators would typically require some kind of management response at the trigger (notification, treatment, or other management action).</li> <li>3) The non-conformity described above would be "major", and certain conditions could constitute a "critical" non-conformity, that will result in immediate suspension of the farm's ASC certificate.</li> </ol> <p><u>Rationale:</u></p> <ul style="list-style-type: none"> <li>• When first established, the 0.1 limit did not have a scientific justification to support that specific level.</li> <li>• Counting accuracy at such a low level is a serious challenge.</li> <li>• There is no globally agreed "silver bullet" level for precautionary lice levels on farms, nor is there a globally relevant length for sensitive periods.</li> <li>• Local regulators are better positioned than ASC to set, and adapt over time, the precise sea lice trigger levels as well as which gender/life stage to monitor and the length of the sensitive period.</li> </ul>	<ul style="list-style-type: none"> <li>• A revised indicator should not refer to local regulation</li> <li>• The current requirement on maximum on-farm lice level of 0.1 mature female lice should be maintained.</li> <li>• The approach leaves behind any effort for a global standard on sea lice exposure and makes permanent all the Variance Requests.</li> <li>• Revised sensitive periods should be set. Currents periods in BC, Canada, and Scotland are insufficiently protective.</li> <li>• Trout's vulnerabilities need to be recognised. Current regulation on trout in certain countries (e.g., Scotland and Norway) is insufficient.</li> <li>• CABs should decide the grade of a non-conformity.</li> <li>• In jurisdiction without regulations to enforce, a maximum level that offers the necessary protection for wild salmon and could be considered top performance should be set in order to gain and maintain certification</li> </ul>	<p>The TG agreed to:</p> <ul style="list-style-type: none"> <li>• Revise and reframe the recommendation to clarify further: The desired state is for ASC to set regionally appropriate sea lice limits and the length and timing of the sensitive periods. Regulatory levels today are a starting place.</li> <li>• Describe further the recommendation to define the length and timing of sensitive periods: e.g., the period of outmigration of wild juvenile salmonids (when wild juveniles are in proximity to cages).</li> <li>• Recommend ASC develop a mechanism that allows prompt revision of the requirement as new knowledge emerges.</li> <li>• Revise the consequences for farms that surpasses <ul style="list-style-type: none"> <li>• the maximum limit level. An option is to follow the approach that ASC took on revising VR's <a href="#">88</a> &amp; <a href="#">144</a>: <ul style="list-style-type: none"> <li>○ The farm needs to inform the CAB of the exceedance.</li> <li>○ If the farm fails to bring sea lice levels below the maximum limit level within a certain timeline, the farm shall not sell the fish as ASC certified.</li> </ul> </li> </ul> </li> <li>• Revise the recommendation for situations where there are no jurisdictional regulations to enforce. In those situations: <ul style="list-style-type: none"> <li>○ The most rigorous level in effect at that point in time (e.g., 0.2 adult female) should apply.</li> <li>○ The length and timing of the sensitive period should be defined following the criterion as per above (e.g., the period of outmigration of</li> </ul> </li> </ul>	<p><b>On setting a regionally relevant lice level:</b></p> <p>The TG is recommending a revision that includes the following elements:</p> <ul style="list-style-type: none"> <li>• ASC sets regionally relevant sea lice limits and sensitive periods: <ul style="list-style-type: none"> <li>○ As a starting place: <ul style="list-style-type: none"> <li>▪ ASC uses the lowest sea lice limit established in the different regions today (established either by the regulators or through an industry code of practice, whichever is lower) as the ASC Sea Lice Thresholds.</li> <li>▪ ASC uses the sensitive period established in the different regions today (established either by the regulators or through an industry code of practice, whichever is longer).</li> </ul> </li> <li>○ ASC should remain open to evidence that would compel it to change these limits and periods and be attentive to the results of regulatory updates.</li> <li>○ In situations where there are no limits nor sensitive period established, ASC will require the use of the most rigorous sea lice limit in effect at that point in time (e.g., 0.2 adult female) and a sensitive period that reflects evidence of the time during which juvenile salmonids are present, using the latest knowledge.</li> <li>○ ASC should annually review sea lice limits in the different regions and update its sea lice thresholds accordingly.</li> </ul> </li> <li>• A farm will become non-conforming if fails to maintain sea lice levels below the ASC Sea Lice Thresholds:</li> </ul>



			<p>wild juvenile salmonids) and using the latest knowledge.</p>	<ul style="list-style-type: none"> <li>○ The farm needs to inform its Conformity Assessment Body (CAB) of the exceedance.</li> <li>○ If the farm fails to bring sea lice levels below the thresholds within a certain timeline, the farm shall not sell the fish as ASC certified. <ul style="list-style-type: none"> <li>▪ Some situations would justify an exemption to the strict timeline limit, such specific environmental events (e.g., algal blooms), weather conditions, actions that could compromise fish welfare, unforeseen increases in on-farm lice levels, or documented logistical roadblocks or delays for implementing treatment.</li> </ul> </li> </ul>
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Aspect	Recommendations	Main Areas of Stakeholders Concern from 1 <sup>st</sup> Public Consultation	TG's Comments & Further Deliberations	Revised Recommendations
<b>D. Regional approaches to the indicator (during the sensitive period) - cont'</b>	<p><b>On Area-Based Management (ABM) Scheme - Salmon Standard, Appendix II-1: Attributes and required components of the ABM:</b></p> <p>1) To clarify the “feedback loop” that needs to happen after the ABM scheme assess the results of wild monitoring required by Indicator 3.1.6:</p> <ul style="list-style-type: none"> <li>• Outcomes of the review shall include a final recommendation and justification for maintaining or adjusting maximum sea lice loads in an ABM. The goal is that an actual review is done, and a recommendation made based on all available information.</li> <li>• Documentation of this review will be standardised, transparent, and it shall include attendees, minutes, recommendations, actions and justification.</li> </ul>	<ul style="list-style-type: none"> <li>• None on the proposed clarification for indicator 3.1.6.</li> </ul>	N/A	N/A

Table 1: TG's recommendations for the revised indicator including the main areas of stakeholder's concern identified for the initial recommendations during past March-April 2021 consultation, the comments and further deliberations from the TG and the revised recommendations resulting from these deliberations.

## Appendix 1 - Technical Note: Lice species for which to set a metric

Published data<sup>22</sup> from sea lice monitoring of wild fish and farmed salmon during sensitive periods from different areas of British Columbia, Canada, and for different years show that for some years and in some areas, the presence of *C. clemensi* on wild and farmed fish is higher than *L. salmonis*. This is perhaps unsurprising given that, while *L. salmonis* is recognised as being almost entirely salmonid specific, *C. clemensi* is considered capable of infecting any fish species living in coastal surface waters across its range<sup>23,24</sup> and is therefore abundant in wild fish populations. In support of this, more recent research<sup>25</sup> that specifically looked at the Gulf Islands area within the Strait of Georgia, an area with no active fish farms, found high levels of sea lice generally exceeding a prevalence of 60% on all species of juvenile Pacific salmon and on juvenile Pacific herring and noted that virtually all sea lice encountered were *C. clemensi*, indicating that high levels of wild fish infection occur in the absence of fish farms and demonstrating the generalist nature of this sea lice species. Other research<sup>26</sup> on wild fish monitoring concluded that: 1) while salmon farms may well be a source of *C. clemensi* for juvenile Pacific salmon, they are unlikely to be the only source or even the dominant source given their generalist nature and, 2) because both lice infest farmed salmon, but only *C. clemensi* infests Pacific herring, conservation science and management regarding sea lice should further consider *C. clemensi* and transmission from farmed salmon and wild fish.

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<sup>22</sup><https://www.cermaq.ca/public-trust/public-reporting>

<https://www.griegseafoodcanada.com/our-environment/wild-salmon/>

<https://open.canada.ca/data/en/dataset/3cafbe89-c98b-4b44-88f1-594e8d28838d>

<sup>23</sup> Parker, R. R., and Margolis, L. (1964). A new species of parasitic copepod, *Caligus clemensi* sp. nov. (Caligoida: Caligidae), from pelagic fishes in the coastal waters of British Columbia. *Journal of the Fisheries Research Board of Canada* 21: 873-889.

<sup>24</sup> Simon R. M. Jones, Gina Prosperi-Porta, Eliah Kim, Paul Callow, and N. Brent Hargreaves (2006). The occurrence of *Lepeophtheirus salmonis* and *Caligus clemensi* (copepoda: caligidae) on three-spine stickleback *Gasterosteus aculeatus* in coastal British Columbia. *Journal of Parasitology* 92(3), 2006, pp. 473–480.

<sup>25</sup> Beamish R, Wade J, Pennell W, Gordon E, Jones S, Neville C, Lange K, Sweeting R (2009). A large, natural infection of sea lice on juvenile Pacific salmon in the Gulf Islands area of British Columbia, Canada. *Aquaculture* 297 (2009) 31–37.

<sup>26</sup> Brookson CB, Krkošek M, Hunt Brian PV, Johnson BT, Rogers LA, Godwin SC. (2020). Differential infestation of juvenile Pacific salmon by parasitic sea lice in British Columbia, Canada. *Canadian Journal of Fisheries and Aquatic Sciences* Volume 77, Number 12, December 2020.