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Seafood Watch Aquaculture Standard: 2019 Review

Public Consultation 1 & 2: Collation of Comments

This document contains a collection of each comment received during the Second Public Comment Period of 2019 (September 19-October 18, 2019). This document also contains a selection of comments received during the First Public Comment Period of 2019 (March 4-May 3, 2019) that had yet to be addressed in the Second Public Comment Period.

Broad Topics: Polyculture, Modified Habitats, Scale of an Industry, Cleanerfish, General Comments

PERIOD	BROAD TOPICS AND GENERAL COMMENTS	
1	<p>General Question 1 – Polyculture <i>How should Seafood Watch incorporate more specific guidelines and measures to evaluate the ecological impacts of polyculture operations? Please consider all potential impact areas, such as nutrient discharge and allocation, escape risk and potential implications of escape, pathogen dynamics, etc.</i></p>	
PERIOD	COMMENT	RESPONSE
1	<p><i>Summary of several comments from Public Comment Period 1: Suggestions for incorporating polyculture into the standard include:</i></p> <ul style="list-style-type: none"> - utilizing the precautionary principal where data on offsets are unavailable - utilizing the lowest score when assessing source of stock - utilizing physical allocation based on production weight for some criteria - performing assessments of some criteria on a species-specific basis" 	<p>PC1: We'll consider this option as we work to update our standard with regard to inclusivity for sustainability aspects of production utilizing polyculture systems.</p> <p>PC2: The assessments are done to evaluate net, and cumulative impacts, and when data are limited the precautionary principal is used.</p>



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		<p>For several criteria (C8X, C10X), the guidance now indicates that each species should be assessed and the lowest score is utilized for the assessment.</p> <p>Physical allocation is inherent in the guidance for polyculture in several criteria, however our overall intent is to capture the cumulative impacts of the system.</p> <p>FINAL: Polyculture guidance and scoring methodology is now incorporated into the Standard and includes a mixture of scoring methodologies depending on data availability and the criterion.</p>
1	<p>General Question 2 – Natural vs. Modified Habitats <i>When it comes to reservoirs and other human-made/modified habitats, how should Seafood Watch be considering the impacts of aquaculture? Should they be treated differently than ‘natural’ habitats? Please consider all potential impact areas, including the physicochemical impacts (e.g. dissolved and particulate waste discharge, physical alteration of habitat by farm siting or presence) and biological impacts (e.g. risk of post-escape competition or pathogen transmission to actively-stocked ‘wild’ fish).</i></p>	
PERIOD	COMMENT	RESPONSE
1	<p><i>Summary of several comments from Public Comment Period 1: human-made environments should be treated as natural environments and all ecosystem services should be considered</i></p>	<p>PC1: We’ll consider this option as we continue to refine the interpretation of this topic.</p>



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		<p>PC2: The impact of aquaculture on the ecosystem services provided by modified habitats is considered. The habitat value, time frame of construction and the type of habitat displaced are all considered for modified habitats.</p> <p>FINAL: Same as PC2</p>
1	<p>This should only affect the habitat value score for criterion C3. All other environmental risks/impacts outlined in other criteria could be still valid and should be assessed as currently defined (e.g. feed, chemical use, disease, escapes, etc).</p>	<p>PC1: We'll consider this option as we continue to refine the interpretation of this topic.</p> <p>PC2: Yes, this is how it has been incorporated.</p> <p>FINAL: Same as above.</p>
1	<p>General Question 3 – Cleanerfish <i>How should Seafood Watch consider including an assessment of the sustainability of cleanerfish use in aquaculture? With regards to cleanerfish populations themselves and to the resources they require or potentially impact, in which criteria are the risks of ecological impact most relevant?</i></p>	
PERIOD	COMMENT	RESPONSE
1	<p><i>Summary of several comments from Public Comment Period 1: cleanerfish should be assessed and all areas of their production should be assessed in the same manner as the farmed fish</i></p>	<p>PC1: We'll consider this option as we work to update our standard with regard to inclusivity for sustainability aspects of cleanerfish use in aquaculture production.</p>



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		<p>PC2: A combination of net impacts, weighted average and lowest impacts are considered depending on the criterion. Cleanerfish are essentially treated as a polyculture species in the standard.</p> <p>FINAL: Cleanerfish will be evaluated following the guidance of Polyculture.</p>
1	If considered at all, this should be addressed as an exceptional 'X' factor given it's limited applicability.	<p>PC1: We'll consider this option as we work to update our standard with regard to inclusivity for sustainability aspects of cleanerfish use in aquaculture production.</p> <p>PC2: We've incorporated this into the standard as part of the polyculture guidance. While it won't apply to every situation, it can be assessed in the same manner as other polycultured species.</p> <p>FINAL: Same as above.</p>
1	<p>General Question 3 – Scale</p> <p><i>How should the scale of an industry contribute to the overall consideration and assessment of its sustainability? How should Seafood Watch assess the scale of an industry, especially as it relates to similar impacts from a related industry? Should the Seafood Watch Standard incorporate a mechanism to factor in this scale within the scoring?</i></p>	
PERIOD	COMMENT	RESPONSE



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<p>1</p>	<p>Simply assessing impact based on per ton of production provides limited information to your specific audiences (consumers, seafood buyers) who are trying to understand if industries are operating within environmentally sustainable limits. Per ton of production impact assessments allow for relative comparison of farming efficiencies, but a fulsome consideration of cumulative impacts and how cumulative impacts are managed (i.e. within scientifically established limits, or not) is critical to provide an accurate assessment of whether an industry is operating within ecologically sustainable limits. It would be a stretch to expect that SFW would (or could) set standards for what are "sustainable" level impacts for the diversity of species, production systems, and environments that are assessed through the SFW standard. Furthermore, incorporating a mechanism to factor in industry scale within the scoring would be very difficult to do -- a large industry isn't inherently more likely to exceed ecological limits than a small industry -- because the sustainability of scale is so context/management dependent. However, greater focus within the SFW standard on the requirements and effectiveness of the regulatory system in place to manage an industry (and its cumulative impacts) within scientifically established ecological limits would help to address whether industries are operating at scales that are ecologically sustainable.</p>	<p>PC1: We'll consider this option as we work to update our standard with regard to improving clarity around the importance of scope and scale in the assessments.</p> <p>PC2: After reviewing the comments received and internal discussions, Seafood Watch has decided against incorporating a mechanism to factor scale into the scoring at this time. This question will continue to be discussed, however it will not be formally incorporated into the standard for the 2019 review cycle.</p> <p>FINAL: Same as above.</p>
<p>1</p>	<p>In theory, Factors 2.1/2.2 of the risk based assessment should address the scenario provided (i.e. nitrogen efficiency of two different species and scale of industry). However, when the evidence based assessment is utilized, literature may demonstrate impacts occurring (or not) but this table fails to address nitrogen efficiencies or management - particularly in relation to cumulative impacts. Integrating factor 2.2 (and potentially 2.1) into the evidence based assessment could help address this issue. In addition, we recommend SFW addresses the following cumulative impact deficiencies of the standard:</p> <ol style="list-style-type: none"> 1. The scale of assessments for cumulative impacts can sometimes be too broad (e.g. country/region level) so that cumulative impacts within a particular waterbody/fjord/bay, etc are not assessed. Likewise, farm-level assessment can miss broader cumulative industry impacts to which the farm contributes. 	<p>PC1: We'll consider this option as we work to update our standard with regard to improving clarity around the importance of scope and scale in the assessments.</p> <p>PC2: After reviewing the comments received and internal discussions, Seafood Watch has decided against incorporating a mechanism to factor</p>



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	<p>2. The cumulative impact of all aquaculture operations within a given area - not just the species being assessed - should be addressed through management/regulatory criteria</p> <p>3. Effective area-based management can help avoid or mitigate a number of cumulative impacts (e.g. disease, parasites, chemicals, etc). Assessing the presence and effectiveness of an ABM scheme within the criteria would aid in assessing overall cumulative impacts.</p>	<p>scale into the scoring at this time. This question will continue to be discussed, however it will not be formally incorporated into the standard for the 2019 review cycle.</p> <p>FINAL: 1) scale was not addressed in this standard update. 2) As of now, other activities besides the production system and species defined in the scope of the assessment, are not assessed. 3) Area based management is incorporated into the scoring methodology of some criterion</p>
1	<p>There is currently no easy answer for this. As noted in a previous comment, it is important to recognize that the SFW aquaculture standard is taking on an enormous challenge to try to define sustainable production at an industry level (i.e. for regional recommendations). This has not yet been achieved for agriculture; for example, even leading programs like the Sustainable Agriculture Initiative platform (https://saipatform.org/) and their Farm Sustainability Assessment (http://fsatool.com/) focus only on farm-level management and do not assess cumulative impacts of multiple farms. As such, while we might have a general perception that (for example) "chicken is more sustainable than beef", this is probably mostly based on a per ton of production basis, and variations within that (e.g. comparing pasture-raised beef to feedlot beef) are likely to be the same. Even LCAs which take on global impacts, are typically based on a unit of production. The SFW standard makes a valiant effort to assess cumulative impacts in many criteria, and should continue to do so, but with the recognition that it is not easy. It is recommended that the concepts of Limit Reference Points (Bridson et al. 2019, in prep) be used to more-robustly define</p>	<p>PC1: We'll consider this option as we work to update our standard with regard to improving clarity around the importance of scope and scale in the assessments.</p> <p>PC2: After reviewing the comments received and internal discussions, Seafood Watch has decided against incorporating a mechanism to factor scale into the scoring at this time. This question will continue to be discussed, however it will not be</p>



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<p>what the acceptable or "sustainable" impacts are for SFW (and perhaps MBA more broadly) and consider the concepts of "strong" and "weak" sustainability (e.g. "strong" defined by Rossberg et al. 2017 as use of the environment that does not constrain usage choices and capabilities of future generations, verse "weak sustainability" defined by Rossberg et al. as use of the environment that simply can be continued indefinitely in its current form.) (Rossberg et al., 2017. <i>Quantitative criteria for choosing targets and indicators for sustainable use of ecosystems. Ecological indicators, 72, pp.215-224.</i>)</p> <p>Two practical aspects might help:</p> <ol style="list-style-type: none"> 1 - adjust the C1 language to emphasize the "confidence" aspect in order to improve the relevance of the evidence-based assessments. 2 - Increase the focus of the scoring of cumulative impacts on evidence (or appropriately justifiable risk), that a cumulative impact is actually occurring (or highly likely to occur). For example there is little (or no) evidence that even intensive salmon farming impacts water quality enough to exceed the carrying capacity of receiving waters (i.e. the appropriate Limit Reference Point for sustainable production), yet many salmon assessments have scores of 4 out of 10 based on "contributions to cumulative or regional impacts". As such, in the example in the yellow box here, both assessments would have similar good scores because there is no evidence that either is having a significant (or unsustainable) impact. The efficiency aspect on a per ton of production basis would also probably be captured in a lower C5 score anyway. <p>As such, I think SFW can continue to use per ton of production indicators as needed, but continue to push the boundaries of assessing the cumulative impacts of a food system (even if it is really challenging). Improve the guidance documents where possible to improve the assessments and review. I know these points don't fully address the problem, but they could be developed and used to reduce the problem substantially</p>	<p>formally incorporated into the standard for the 2019 review cycle.</p> <p>FINAL: Inclusion of Limit Reference Points into criterion and defining these thresholds is an ongoing process and will be a point of discussion with the intent to continuously improve the standard and our assessments. SFW has incorporated to the best of its abilities sustainability thresholds into the standard.</p>
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	GENERAL COMMENTS
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PERIOD	COMMENT	RESPONSE
1	<p>With regard to assessment simplification, the science, justification and supporting/background information for each criterion and assessment methodology needs to be built into the standard and supporting documents and not into each report. Authors and reviewers spend large amounts of time on every report doing background research for introductory and supporting text and then reviewing and correcting it etc. As such, I suggest SFW develops a robust supporting document that closely accompanies the Standard and the reports, which contains all the relevant scientific support and is updated regularly with current information and references. Then the "background and rationale" content that is in the current version of the standard document could be removed (simply refer to the "guidance" document), and each criterion in a SFW reports would also refer to the guidance document for the relevant information. The SFW reports can then become much more concise, dealing only with the specifics of the assessment, and the reader is referred frequently to the guidance doc for the background information. The analyst also has all the background information immediately at hand and (hopefully) writes a better assessment which in turn needs less review time. The document list becomes:</p> <ul style="list-style-type: none"> ○ 1 SFW Aquaculture Standard - public ○ 2 SFW Aquaculture Principles, Background and Rationale document - public ○ 3 Report Template - private ○ 4 Analyst Guidance and checklist - private ○ 5 Reviewer Guidance and checklist – private 	<p>PC1: We'll consider this option when we're looking into further process improvements, as they would relate to the standard.</p> <p>PC2: Thank you for the comment and we are discussing this as an option. At the moment, action has not been taken. Once the 2019 standard review has been completed, we'll be looking further into improvements in our processes, especially as they relate any changes that are made in the standard.</p> <p>FINAL: Same as above.</p>
1	<p>The principles in the preamble have served SFW well for several years, but with an increasing awareness of the challenges of defining sustainable aquaculture, it would be beneficial to consider tweaks to them which can then be used in related criteria to clarify some scoring options. With regard to the MBA/SFW definition of "conservation" - what level of impact is accepted under this definition? There are no available robust definitions of sustainable aquaculture as a whole, or for any of the specific impacts, and there are no limit reference points to define acceptable impacts. This is reflected in several places in the</p>	<p>PC1: We'll consider updating these changes throughout the standard.</p> <p>PC2: We agree that the Guiding Principles could use an update, but this is outside of the scope of the standard revision process (as the</p>



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<p>principles with references to any level of impact, or even a contribution (of an undefined scale) as being a reason for concern and a score less than 10 out of 10. This is in contrast to the SFW fisheries standard that pragmatically accepts that quite a large impact to a fish stock can be sustainable. Critics of SFW aquaculture assessments have implied aquaculture should have no impact on wild salmon populations while simultaneously supporting (sustainable) fisheries for them.</p> <p>Suggestion - consider the fisheries principle language; e.g. "Abundance of the main species affected by the fishery should be at, above, or fluctuating around levels that allow for the long-term production of maximum sustainable yield". In this context, consider the concept of limit reference points elaborated in the Certifications and Ratings Collaboration to help refine the scales of impacts and the 0-10 scoring categories in the standard.</p> <p>In this context it is important to recognize that the SFW aquaculture standard is taking on an enormous challenge to define sustainable production at an industry level (i.e. for regional recommendations). This has not yet been achieved for agriculture; for example, even leading programs like the Sustainable Agriculture Initiative platform (https://saipatform.org/) and their Farm Sustainability Assessment (http://fsatool.com/) focus only on farm-level management and do not assess cumulative impacts of multiple farms.</p> <p>Some comments on the principles that support some other comments in different criteria:</p> <ul style="list-style-type: none">○ In Principle 2 - suggest changing "exceed, or contribute to exceeding" to "exceed, or substantially contribute to exceeding". This supports other suggestions provided below for C2 and concepts in the SFW Fisheries Standard. Further, the principle of "contributing to exceeding" (or substantially contributing) implies that the carrying capacity has been exceeded before we see a problem, but C2 doesn't honor this concept. It seems important that either the local or the waterbody carrying capacity should be exceeded before scoring is penalized (i.e. unless the carrying capacity has been exceeded, the impact is probably sustainable). This language is in	<p>guiding principles place bounds on what is in scope). However we'll be assessing a potential update in their language after the 2019 review cycle has completed.</p> <p>Final: No changes were made to the guiding principles.</p>
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	<p>the text immediately above the C2 Evidence scoring table, but is not typically taken into account.</p> <ul style="list-style-type: none">○ Principle 4 - "low risk of impact" is not sufficiently clear. An impact is okay as long as it is "sustainable". Does this mean at the site-level or cumulatively across lots of sites? It would be sustainable to eliminate non-target organisms in a small area around the farms if the broader environment was unaffected. It is very challenging to robustly define what the concern is here.○ Principle 6 - what are "population-level impacts"? Affecting the genetic profile of wild fish in a population may be okay if it doesn't affect the fitness of the fish or their survival, and affecting their survival is okay if it is sustainable. Affecting a population size is also okay if it is sustainable. Consider what○ Principle 9 - suggestion to consider the fisheries principle: "The fishery avoids catch of any threatened, endangered or protected (ETP) species. If any ETP species are inadvertently caught, the fishery ensures and can demonstrate that it has no more than a negligible impact on these populations."	
1	<p><i>Summary of several comments from Public Comment Period 1: Animal welfare is an issue that contains aspects of sustainability concerns and Seafood Watch should incorporate it into their standards</i></p>	<p>FINAL: Animal welfare is indeed an issue with increasing visibility in our food systems. The Seafood Watch standard focuses solely on environmental sustainability or production at the regional level, and thus does not specifically incorporate animal welfare concerns. However, there are situations where those concerns overlap with environmental sustainability (e.g. lower stocking densities and the associated</p>



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		<p>reduction in nitrogenous wastes in the effluent water).</p> <p>Traceability is very important for the seafood industry and for this we recommend producers and seafood purveyors utilize farm-level certification schemes that incorporate chain of custody/traceability. The Seafood Watch standards are at a regional level, and thus do not assess the traceability of any one specific product.</p>
1	<p>It does not become clear how the assessment process works. The introduction states that the standard was designed to assess from individual farm to nationwide industry. How do you prevent generalization for a whole country/industry?</p> <p>Does the farm/industry ask for assessment or does the Seafood Watch program choose what/who to assess? What is the protocol in this? Is there a periodical assessment, and if so, is it the same farms/region each time? Please state this more clearly in the introduction.</p> <p>Is there a mandate to prevent industry influence on the assessment of an individual farm/country, and how is this regulated?</p>	<p>FINAL: Assessments are scoped defining a particular species, production system, in a defined region. All aquaculture activities within this scope are evaluated for each criterion. The assessments, by nature, are a rough indicator of the general practices of a given industry in a given country or region. Assessments are conducted based on the current makeup of the US market and are updated every 3-5 years. All assessments go through an internal and an external review process and data used to justify scoring are publicly available, or made publicly</p>



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		<p>available. These data are sourced from governments, academia, industry and other experts. Further information about the data requirements are outlined in Criterion 1: Data</p>
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Getting Specific: Feedback by Criterion

CRITERION 1: DATA		
GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
2	<p>Clarity required for "feed" in Table 2 for aquaculture systems that do not have feed inputs.</p> <p>Clarity required on definition of "trans-water body movement" in Table 2.</p>	<p>We have decided to remove the “N/A” option for all data categories, as we suggest that all criteria are relevant to all assessments, even if no ‘impact’ is realized in a given industry (e.g. no feed-related impacts for unfed systems).</p> <p>“Trans-waterbody movements” are more thoroughly defined in Criterion 10X as follows: “Trans-waterbody movements take place when the source waterbody is ecologically distinct from the destination (farming) waterbody, such that the movements represent a risk of introducing species (pathogens, parasites, other</p>



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		secondary species) not present in the destination waterbody.” FINAL: Same as Above.
1&2	<p>During the first public comment period, SeaChoice submitted the following: "Other standards, such as the ASC, have established minimum public reporting requirements within their criteria. We strongly urge the SFW to follow similar practice by establishing public disclosure requirements for the data criterion...". SFW responded with "All Seafood Watch reports are based on publicly available information, or private information with permission to publish in the report. Where there is minimal publicly available information, this results in a lower score for the Data Criterion." While we understand that "private information with permission to publish" is also permissible, we suggest publicly available information should be weighted and scored higher (i.e. not at par with private information) to reward best practice in open disclosure, that in turn, will provide the following benefits:</p> <ol style="list-style-type: none">1) provides increased confidence in data provided for subsequent criteria; and2) will encourage less transparent producers and regulators to move towards public disclosure. <p>SeaChoice would also like to clarify and reiterate another previously submitted comment: "No assessment with a 'red' data score should result in a 'buy' recommendation. Where data availability is very low (score 2.5 or lower), we recommend this red data score should trigger an overall red ranking recommendation. As data informs the rest of the assessment, very low data results in many 'unknowns' by default (e.g. chemical use, disease impacts, escapes, etc)." To which SFW responded with: "Currently, if any criteria are ranked “red”, an assessment cannot be considered overall “green” regardless of the associated score. The suggested change would result in an additional scoring rule (outlined on page2-3 of the Seafood Watch Standard)." To clarify, when we state "no assessment with a</p>	<p>We understand the intent of the comment, and agree that publicly available information should be recognized. However, nearly every criterion in every assessment utilizes a mix of already-public and previously-private or not easily accessible data and information. In addition, there are many factors of nuance - beyond public availability - in our determination of confidence in such data and information to allow us to assess or estimate the ecological impacts, such as recency, geographic relevance, species relevance, ability to triangulate, collection methodology, granularity, etc. As such, blindly weighting publicly available information (as defined by the commenter) higher than previously-private information is not wise.</p> <p>Regarding ‘red’ data scores, while we do agree the quality of the data plays an integral role in the accuracy of the entire assessment, Seafood Watch will not be instituting a decision rule restricting an</p>



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	<p>'red' data score should result in a 'buy' recommendation." we are referring to SFW's 'buy' recommendations equating to both "green" and "yellow". We understand an assessment with any red criteria cannot be considered an overall "green"; however, one red criteria can still result in an overall "yellow" (and a 'buy' recommendation). We again submit the comment that no assessment with a "red" data score should result in an overall 'buy' (i.e. "green" or "yellow") recommendation, given the low confidence / unknown data for the subsequent criteria.</p>	<p>overall score based solely on a red Criterion 1 score. Data provision and availability vary widely among industries and regions and while promoting transparency is of utmost importance, on its own it is not necessarily indicative of an environmental impact worth red listing an entire industry for.</p> <p>FINAL: Same as above.</p>
2	<p>Data manipulation with fraudulent purposes must be classified as low criteria</p>	<p>We agree.</p>
1	<p>For end consumers full transparency about the whole value chain of what is on their plate is becoming increasingly important. Therefore, those feed producers and farmers knowing and controlling their whole value chain should be rewarded by a high scoring in the Standard.</p> <p>Considering the new developments of alternative feed ingredients, in the category "feed" in Table 2 fishery-specific indicators for impacts on marine ecosystems such as overfishing or sea floor damage should be asked for.</p> <p>The following LCA metrics are currently scientifically recommended:</p> <p>FFER or FFDR (Forage fish dependency ratio) SSD: Sea surface dependency PPR: Primary production of photosynthetic carbon required OF: Overfishing through fishing mortality</p> <p>The metrics are described in detail on page 52 (Criterion Feed Question 1).</p>	<p>We do indeed already utilize metrics and indicators of impacts to aquatic ecosystems by fishing. Regarding the examples given in the comment, Factor 5.1a includes FFDR, Factor 5.1b includes metrics incorporating overfishing and fishing mortality, and Factor 5.3 formerly was scored according to the area of sea and land area required for primary productivity that supported an industry's feed demand; in order to more appropriately capture the impacts of aquatic and terrestrial ingredients, LCA data will be used to score Factor 5.3 going forward.</p>



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		<p>Criterion 1, here, assesses our confidence in our ability to assess the feed-related impacts of an industry.</p> <p>FINAL: Same as Above.</p>
1	<p>The idea to not only reward the availability of high quality information but also using this information within the different criteria as well, is reasonable and shows a good concept.</p> <p>Nevertheless, the wording in this section is very vague in many occasions. Given the importance of this Criterion for the overall standard words such as: typical or average farms, relevant, within reason, appropriate methods etc. should be clearly defined.</p> <p>A "High" score is, among others, given when peer reviewed research is available. It is not defined if a single study would be enough (which should not be the case) and if there is a limitation to the study in terms of "age". On the other hand a "low" score is considered if data is "out of date". This clearly raises the question when data would be considered out of date.</p> <p>Generally the scope of interpretation within this Criterion is very subjective and potentially based on the auditor/assessor. Is there any specific requirement for these people in terms of knowledge of the region/industry?</p>	<p>FINAL: We understand that some language can seem vague or undefined. In many cases, as the Standard must be applicable to all aquaculture production globally (i.e. all species, all geographies, all systems, all scales), the language was chosen specifically to communicate intent rather than define specific thresholds or requirements. As nearly every criterion in every assessment uses a wide range of data and information to craft a scientific narrative about the ecological impacts of the industry under assessment, it is difficult or impossible to administer specific requirements for scoring our confidence in the data and information available to us.</p> <p>Similarly, subjectivity may seem apparent and the background and familiarity of an assessment author can contribute to varied interpretation. No specific requirements exist for assessment authors' initial familiarity with an industry,</p>



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		<p>however their background with regard to species, production system, and geography is indeed best matched to the assessments available for authorship. Annual training of assessment authors is conducted and consistency in interpretation is rigorously upheld by the process of assessment publication, particularly internal review.</p>
2	Criterion 1 Question 1 –some language has been modified to clarify existing intent	
PERIOD	COMMENT	RESPONSE
2	<p>No specific comments on the language used, although it might be appropriate to clarify the scope of chemical use. On the feed aspect, it might be better to refer to environmental footprint, calculated as in Criterion 5 and use the data source (i.e. secondary data vs primary data) for data qualification.</p>	<p>FINAL: The scope of chemical use is more thoroughly defined in Criterion 4, and the information pieces sought for those chemicals are described in Table 2.</p> <p>The metrics cited in Criterion 1 summarize those more thoroughly defined in Criterion 5 which - as noted in the comment - assess the ‘environmental footprint’ as we define it (i.e. the impact to marine ecosystems resulting from use and acquisition of raw materials for feed). The sources used are collectively scored according to the criteria in Table 1.</p>
1	<p>Criterion 1 Question 1 –Removing “NA” from the data scoring table <i>Would there be a benefit to requiring each data subscore to have a numerical score (eliminating the option for ‘n/a’)? Or would this increase the risk of artificially inflating the score for data availability in impact areas that can be considered ‘not applicable’ to production, like feed for molluscan industries?</i></p>	



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PERIOD	COMMENT	RESPONSE
1	<p>Support n/a remaining in the scoring table only for specific instances of production that does not use feed, for example. The vast majority of species assessed should have data available for all categories. That said, some of the details under the data description may be treated as n/a, and this should not affect the overall score for that category (e.g. inclusion of area-based or cumulative impact measures- if farms are adequately remote, this data is irrelevant). / Very few examples other than non-fed production should qualify for an n/a under this criterion, but do support keeping the n/a option for shellfish/seaweed etc.</p>	<p>FINAL: We have decided to eliminate the “N/A” scoring option for all data categories. We consider all 10 criteria in the Aquaculture Standard to be relevant to all aquaculture systems, even in those cases where the “impact” is not realized (e.g. the feed-related impact in unfed systems). Determining that an ‘impact’ is not occurring (e.g. that exogenous feeds are not given to farmed bivalves) still requires sufficient information to make that determination. As such, all data categories will be scored according to our confidence in the information available to us to assess or estimate the impact of each criterion.</p>
1	<p>We recommend the elimination of "N/A" and replacing it with minimum score to avoid misinterpretation of use of n/a. This would not create an artificially inflated score. Take the example of mollusk industries, which use no feed. They should receive the highest possible score for this exact reason as the ultimate intention of the rating system is to signal the "sustainability" of the product. The scoring system is a better representation of the actual production system.</p>	<p>FINAL: We agree regarding the relevance of all criteria - even in situations where the impact is not realized - and as such, will remove the “N/A” scoring option and score the data category for all criteria.</p>
1	<p>Do not remove "n/a" as a scoring option in Table 2. It is a valid 'score' in many circumstances and if you remove it, you risk either penalizing or artificially inflating the final score for that industry. (i.e. bivalve culture where there is no feed, then data score for feed should be n/a not '0' or '10'.)</p>	<p>FINAL: We have decided to eliminate the “N/A” scoring option for all data categories. We consider all 10 criteria in the Aquaculture Standard to be relevant to all aquaculture systems, even in those cases where the “impact” is not realized</p>



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		(e.g. the feed-related impact in unfed systems). Determining that an 'impact' is not occurring (e.g. that exogenous feeds are not given to farmed bivalves) still requires sufficient information to make that determination. As such, all data categories will be scored according to our confidence in the information available to us to assess or estimate the impact of each criterion.
1	SeaChoice recommends scoring based on the relevance of the production species/method. Therefore, it does not make sense to provide a score for categories that are not relevant. Provided the assessor includes reasons in the assessment for assigning the "n/a" option, sufficient transparency is maintained.	FINAL: We have decided to eliminate the "N/A" scoring option for all data categories. We consider all 10 criteria in the Aquaculture Standard to be relevant to all aquaculture systems, even in those cases where the "impact" is not realized (e.g. the feed-related impact in unfed systems). Determining that an 'impact' is not occurring (e.g. that exogenous feeds are not given to farmed bivalves) still requires sufficient information to make that determination. As such, all data categories will be scored according to our confidence in the information available to us to assess or estimate the impact of each criterion.
1	Fine to remove it, but perhaps also remove the "energy" row until it becomes part of the assessment. The "molluscan feed" examples are few and far between, they are somewhat justified for getting a high data score because you do have confidence in	FINAL: We have decided to eliminate the "N/A" scoring option for all data categories. We consider all 10 criteria in



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	<p>the feed situation, and it is unlikely to change any overall scores/recommendations. Always simplify wherever possible - so yes, remove the n/a. I have added other comments that C1 should focus more on the "confidence" aspect of understanding the assessed production system (rather than the bulleted examples in the scoring cells) and this approach is consistent - i.e. you have high confidence that you understand the feed situation of a mollusc assessment so it justifies a high data score.</p>	<p>the Aquaculture Standard to be relevant to all aquaculture systems, even in those cases where the "impact" is not realized (e.g. the feed-related impact in unfed systems). Determining that an 'impact' is not occurring (e.g. that exogenous feeds are not given to farmed bivalves) still requires sufficient information to make that determination. As such, all data categories will be scored according to our confidence in the information available to us to assess or estimate the impact of each criterion.</p> <p>We have removed the Energy data category, as energy-related impacts (for farm operation) are not within the current scope of Seafood Watch recommendations.</p>
1	<p>A "Not applicable" option does not make sense in this part of the standard as it is about the data availability, not about the actual action itself. Meaning that in order to set the score to n/a the reviewer would need some sort of data to base this decision on. If there is no data available on a certain topic than this topic should be scored accordingly (0).</p>	<p>FINAL: We agree regarding the relevance of all criteria - even in situations where the impact is not realized - and as such, will remove the "N/A" scoring option and score the data category for all criteria.</p>
2	Criterion 1 Question 2 – The option for 'NA' as a score in Data Table 2 has been removed	
PERIOD	COMMENT	RESPONSE
2	<p>It makes sense to remove the n/a in the table.</p>	<p>FINAL: We agree regarding the relevance of all criteria - even in situations where the impact is not realized - and as such, will</p>



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		remove the “N/A” scoring option and score the data category for all criteria.
2	<p>We have concerns over the removal of the n/a option as it has implications for for non-fed species such as bivalves and extensive systems plus the chemical use section with respect to extensive systems.</p> <p>Note that the "not applicable" or "not used" option been incorporated into the scoring of the feed section i.e., "This criterion is only applied to those aquaculture operations that use external feed. If no external feed is applied, the score is 10 out of 10." Should there be something similar for chemical use?</p>	<p>FINAL: We have decided to eliminate the “N/A” scoring option for all data categories. We consider all 10 criteria in the Aquaculture Standard to be relevant to all aquaculture systems, even in those cases where the “impact” is not realized (e.g. the feed-related impact in unfed systems or systems which do not administer chemicals). Determining that an ‘impact’ is not occurring (e.g. that exogenous feeds are not given to farmed bivalves or that chemicals are not utilizes) still requires sufficient information to make that determination. As such, all data categories will be scored according to our confidence in the information available to us to assess or estimate the impact of each criterion.</p>
2	Criterion 1 Question 3 –The ‘Energy Use’ category has been removed from Data Table 2, as it is not currently used in Seafood Watch Assessments	
PERIOD	COMMENT	RESPONSE
2	We can agree with this, if it is limited to energy on aquaculture site	FINAL: The intent was indeed limited to the energy used on site (i.e. not embedded in feeds and energy utilization), but as noted, it is currently outside the scope of Seafood Watch assessments as



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		<p>defined by the Guiding Principles. It will remain removed from the Data criterion.</p> <p>We did however develop a tool with Dalhousie University to provide some information on the greenhouse gas emissions related to different types of seafood.</p>
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CRITERION 2: EFFLUENT		
GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
1&2	<p>Other: During the first public comment period we submitted the following: "For Factor 2.2a Content of effluent management measures, we recommend including qualifying language that defines minimum standard for effluent regulation (e.g. BOD, dissolved oxygen, redox, sulphides, nitrogen and/or phosphorus, etc monitoring and reporting)." For which, SFW responded with "We can consider incorporating more clarifying language and guidance into this criterion." This has not been done in A3.2 - we again recommend incorporating this.</p>	<p>FINAL: The Seafood Watch standard does not set prescriptive limits for aquaculture effluent in an effort to ensure its applicability across all water bodies, production systems and species raised while avoiding the preference for being overly prescriptive. While there are many potential thresholds for water quality indicators, it is nearly impossible for our standard to include each specific situation on its own. Ensuring this flexibility within the standard allows us to assess each situation based on its unique properties.</p>
2	<p>We agree on having all environmental impact assessment for benthos (AZE) on the effluent. Is a reasonable analysis criteria.</p>	<p>FINAL: The Seafood Watch standard does not set a prescriptive definition for the AZE an effort to ensure its applicability across all water bodies, production</p>



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	<p>We also agree on having Evidence-Based Assessment as method of assessment, because we believe there is enough good data available.</p> <p>We think the AZE calculation must be clearly defined, and "all locations proximal and distant to the farm" must be also specified regarding distances.</p>	<p>systems and species raised while avoiding the preference for being overly prescriptive. Ensuring this flexibility within the standard allows us to assess each situation based on its unique properties.</p>
2	<p>Allowable zone of effect (AZE), need to be defined more precise way.</p>	<p>FINAL: The Seafood Watch standard does not set a prescriptive definition for the AZE an effort to ensure its applicability across all water bodies, production systems and species raised while avoiding the preference for being overly prescriptive. Ensuring this flexibility within the standard allows us to assess each situation based on its unique properties.</p>
1	<p>We recommend to not only assess the effluents as such and their effects on nutrient concentration in surrounding waters (local and regional) but to also evaluate the impact on nutrient stoichiometry. Scientific data suggest that a change in nutrient stoichiometry can have severe influence on food chain and food web structure and functioning, respectively, with potential detrimental effects on ecosystem functioning and services. Sommer et al. (2002) suggest, for example, irreversible shifts from systems resulting in fish production towards food webs resulting in jelly fish dependent on the ratio of dissolved C:N:P:Si in the water body. According experiments have been conducted within EU project MARICULT / COMWEB including aquaculture related sites in Norway (Vadstein & Olsen 2000, Olsen et al. 2001).</p> <p>Sommer U, Stibor H, Katechakis A, Sommer F, Hansen T (2002) Pelagic food web configurations at different levels of nutrient richness and their implications for the ratio fish production. <i>Hydrobiologia</i> 484(1):11-20</p>	<p>FINAL: When data availability allows for an evidence-based effluent assessment, cumulative impacts are assessed in the Effluent criterion. Nutrient stoichiometry is indeed a relevant indicator, however this information is not necessarily available at all scales for all production systems.</p>



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	<p>Olsen Y, Reinertsen H, Andersen T, Gismervik I, Duarte C, Agusti S, Stibor H, Sommer U, Lignell R, Tamminen T, Lancelot C, Rousseou V, Hoell E, Sanderud KA (2001) Comparative analysis of food webs based on flow networks: effects of nutrient supply on structure and function of coastal plankton communities. <i>Continental Shelf Research</i> 2001 (21):2043-2053</p> <p>Vadstein O, Olsen Y (2000) Sustainable Increase of Marine Harvesting: Fundamental Mechanisms and New Concepts. <i>Proceedings of the 1st Maricult Conference held in Trondheim, Norway, 25–28 June 2000</i></p>	
1	<p>The idea of basing the approach on Criterion 1 is sufficient and should be kept. However, it is stated that the EBA should be considered in case the Criterion 1 – Data score is higher than 7.5. While in the intro of the Risk Based Assessment states that the RBA should be considered if the Criterion 1 score is equal to 5 or lower. What should be considered between these scores?</p> <p>This criterion is based on the assumption that raceways or fully RAS do not discharge any water at all. This is highly unlikely and should not be assumed. Water discharge in these systems is usually low but at the same time discharged water contains more accumulated substances than in other systems. The basic score for raceways should therefore not by default be zero. Additionally, according to the final decision table aquaculture practices with an effluent management score of zero (meaning potentially illegal activities in place) could still maintain a total score of 10, if the effluent score is 10. As there are no aquaculture practices with no effluents at all, this should not be possible.</p> <p>Reasoning for the basic scores per system within the table would be appreciated</p> <p>What data is the nitrogen table in 2.1 based on? Are different surrounding areas considered?</p>	<p>FINAL: Possible scores are only: 10, 7.5, 5, 2.5 and 0.</p> <p>The Seafood Watch Aquaculture Standards allow for a grey zone where trained analysts and reviewers can decide whether the available data are robust enough to perform an evidence-based assessment or a risk-based assessment.</p> <p>Regarding the reasoning for basic scores, much of this information is outlined in the ‘background and rationale’ section of the standard.</p> <p>Regarding denitrification: this would be captured as an adjustment in the 2.1 table.</p>



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	<p>In the rational it is stated "The nitrogen output is determined by the nitrogen available (as protein) in harvested farmed fish." - What if denitrification active or passive is in place?</p> <p>Factor 2.2a: Assessment table, moderate, mentions that the entire production cycle must be covered. Maybe this should be included in the higher ranked scores as well.</p> <p>Footnote number 8 should be moved to the previous page</p> <p>How are Key Indicator Species defined?</p>	<p>2.2a: the scoring table is intended to build upon the previous, lower scores. So, incorporating thresholds for the entire production system would be inherent in the higher scores.</p> <p>Footnote 8: this is no longer relevant</p> <p>Key Indicator Species: thank you for your comment; we have added a definition for this.</p>
1	<p>Our recommendation is to keep two options but maintain a system that limits the rating that can be achieved for risk based system. However, limiting risk based systems to achieving a maximum of "yellow rating" could have the unintended consequence of "penalizing" small scale producers as they are the most likely to lack readily available data.</p>	<p>PC1: We can consider this option with regards to how it will affect the scoring rules.</p> <p>PC2: Both the risk and evidence-based approaches should have the ability to reach a full score.</p> <p>FINAL: Risk and Evidence based effluent assessments may be scored 0-10.</p>
1	<p>For Factor 2.2a Content of effluent management measures, we recommend including qualifying language that defines minimum standard for effluent regulation (e.g. BOD, dissolved oxygen, redox, sulphides, nitrogen and/or phosphorus, etc monitoring and reporting).</p>	<p>PC1: We can consider incorporating more clarifying language and guidance into this criterion.</p>



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		<p>PC2: The Seafood Watch standard does not set prescriptive limits for aquaculture effluent in an effort to ensure its applicability across all water bodies, production systems and species raised while avoiding the preference for being overly prescriptive. While there are many potential thresholds for water quality indicators, it is nearly impossible for our standard to include each specific situation on its own. Ensuring this flexibility within the standard allows us to assess each situation based on its unique properties.</p> <p>FINAL: Same as PC2.</p>
1	<p>Suggest that the following concept in the background/rationale be reconsidered: "This criterion applies to effluent effects outside the farm boundary or beyond an allowable zone of effect. Effluent impacts within the farm's boundary, immediate area or allowable zone of effect are addressed in Criterion 3 – Habitat." Follow on comments under C3, but in short I suggest that C2 should focus entirely on the impacts of effluent (soluble and insoluble) both within and beyond the AZE. This would allow for better clarity that C3 is intended to assess the impact of farm(s) siting on habitat functionality.</p>	<p>PC1: We can consider this option as a modification to the current application for both Criterion 2: Effluent and Criterion 3: Habitat.</p> <p>PC2: Yes, we agree and have proposed this change.</p> <p>FINAL: Habitat now evaluates the physical impacts of an aquaculture operation, while effluent includes nutrient impacts both near and far.</p>



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1	<p>Change the emphasis in C1 to the "confidence" aspect to allow more flexible use of the evidence-based assessment here in C2. Then also change the language in the C2 Evidence assessment from the exclusivity of "data" to "data and/or other relevant information" (or something like that) to allow greater flexibility when there might not be specific water quality data (e.g. actual measurements of total nitrogen or chlorophyll etc) available. The "cause or contribute to" and "contributions to cumulative local or regional impacts" language in C2 Evidence assessment is challenging to interpret and would benefit from greater clarity or guidance. Every farm in theory contributes to regional impacts. My initial suggestion is to clarify that cumulative or regional impacts must be apparent (i.e. evidence of) for these scores to be applied, and that aquaculture is a "substantial contributor" to those impacts. This language is already partly in the text immediately above the C2-Evidence scoring table, but it is not typically taken into account in an assessment. The combination of factor 2.2a and 2.2b in the risk assessment often leads to very low management scores. This is often perhaps correct, but difficult to justify robustly (particularly when management is limited in response to a low perceived risk of impact). No specific suggestions at present, just flagging it.</p> <p>Lastly, it is often the case that the C2 risk assessment produces results around a score of 4 without any real concern or without even limited data/evidence that there is actually an impact. It is important to note that this is often consistent with the same assessment being done with the evidence-based assessment and supports the need for greater scores in the absence of demonstrable impacts from the industry (and greater flexibility to use the evidence-based assessment to recognize this).</p> <p>Overall, reconsider the level of concern in this criterion (perhaps using the concept of limit reference points plus examples from well-studied industries) and reconsider the scoring thresholds.</p>	<p>PC1: We can consider incorporating more clarifying language and guidance into these criteria.</p> <p>PC2: In the recently proposed changes, the scopes of C2 and C3 have been sorted more logically, which should address many of the concerns indicated here.</p> <p>FINAL: Effluent now consists of nutrient related impacts both near and far, while habitat impacts include the physical impact of the aquaculture farms. This does change the scoring assessment, but moving forward the scoring thresholds for management and enforcement of risk based and evidence based and its potential inclusion of limit reference points will be evaluated.</p>
2	Criterion 2 Question 1 –	



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	The proposed modifications to the Evidence-Based Assessment option that aim to more comprehensively assess the impacts of effluent-related discharge at all distances from the farm footprint.	
PERIOD	COMMENT	RESPONSE
2	Evidence based approach - low effluent concern - clarity required on "reversible". Reversible in a month? Year?	FINAL: The Seafood Watch standard does not set a prescriptive definition for 'reversible' impacts an effort to ensure its applicability across all water bodies, production systems and species raised while avoiding the preference for being overly prescriptive. Ensuring this flexibility within the standard allows us to assess each situation based on its unique properties.
2	1. SeaChoice agrees with the proposed modifications.	Thank you for your comment.
2	- We support the direction of including all effluent impacts (near and far field) in Criterion 2, while limiting Criterion 3 to physical habitat impacts.	Thank you for your comment.
2	- In the evidence-based assessment, the definition of Score 8 still refers to "reversible impacts" whereas we note other scores have moved to using language such as "occasional", "minor" and "temporary". We suggest better consistency in the use of all of these terms, as well as clearer definitions would be helpful for all users of the standard. For the evidence-based assessment, Score 6 (Low-Moderate Concern) currently has two clauses in the example/definition separated by a 'but'. Suggest that this be an 'and' - i.e. "Data show that effluent discharge(s) result in occasional and temporary impacts within the immediate vicinity of the farm, AND there is potential for cumulative impacts at the waterbody or regional scale"	Thank you for bringing this to our attention; we've modified the language a bit more for clarity based on these suggestions. FINAL: Changes have been made for more consistency and clarity. Thank you for your comment.
2	Criterion 2 Question 2 –	



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	The guidance inserted for polyculture systems in the Risk-Based Assessment, as it pertains to accounting for broad nutrient dynamics and their impacts on effluent specific to polyculture systems.	
PERIOD	COMMENT	RESPONSE
2	2. The guidance is very high level. More information is necessary to inform what evidence and/or calculations would be sufficient in justifying the scoring adjustment.	<p>We agree that this guidance is high-level and this is intentional. So far, polyculture has played only a minor role in our assessments, but we expect that reports incorporating polyculture will be more prevalent in our future. Detailed guidance on polyculture can be developed in the form of a broader guidance document as further assessments pilot this initial high level guidance.</p> <p>FINAL: Polyculture Guidance has been added to the standard with clearer guidance on how to score each criterion and is dependent on the data available and the type of polyculture system.</p>

	CRITERION 3: HABITAT	
	GENERAL COMMENTS	
PERIOD	COMMENT	RESPONSE
1	Will the definition of "recent past" stay at 15 years or will this be based on the year 1999? Since this baseline is derived from the RAMSAR convention, maybe it would be better to use 1999 as a baseline. It is now 2019, and the 15 years is no longer applicable to RAMSAR	The text has been edited and uses the baseline of year 1999.



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	<p>Please define "average habitat types"</p> <p>Define how the assessor will determine what the key ecosystem services are, and which methodology should be used to determine if these are lost or not within the past 15 years. Which indicators are considered valid? What types of evidence are considered valid?</p> <p>The table in Appendix 1 does not give enough guidance on this.</p> <p>Determining if the farm is the cause of impact for example would be a possible addition</p>	<p>Ecosystem services are a very broad concept and vary depending on the ecosystem in question. This is often assessed on a per-ecosystem basis but we will consider incorporating more detailed guidance into a separate document for analysts.</p> <p>The level of impact to habitats and associated ecosystem services are described further in Appendix 1.</p> <p>The scale of the industry and therefore its impact to the habitat are considered.</p> <p>FINAL: Seafood Watch has changed the text in the Standard to use 1999 as the baseline year. In addition to the principle, background and rationale, and assessment scale, Appendix 1&2 elaborate on how to assess habitat impacts. Ecosystem services and impacts are evaluated within each assessment to ensure that the granularity is appropriate and the best information at hand is used. Guidance on the severity of ecosystem service impacts and the resulting score are now further defined in Appendix 1.</p>
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1	<p>Criterion C2 should assess the impact of effluent (soluble and insoluble) on the farm site and beyond (if applicable). While C3 should focus on assessing the impact to habitat from the physical siting of farm(s) and cumulative impact to habitat functionality.</p>	<p>PC1: We can consider this option as a modification to the current application for both Criterion 2: Effluent and Criterion 3: Habitat.</p> <p>PC2: We agree and have proposed this moving forward.</p> <p>FINAL: Changes to the standard have been made. Effluent criterion evaluates soluble and insoluble impacts near and far, while Habitat assess the physical siting of farms and any cumulative impacts.</p>
1	<p>Regarding boundaries, for net pen farms, consider using the larger licensed area as the boundary; it may be more practical than the current emphasis on the AZE. This would make it easier to separate C2 and C3 for net pen assessments (i.e. C2 becomes water column impacts and C3 is just benthic). It would also be more adaptable to a greater variety of benthic impact regulations or management measures (and their monitoring data) that typically allow a substantial impact within the AZE, and a lesser impact beyond it in a transition area to the edge of the licensed area where there should typically be no detectable impact.</p>	<p>PC1: We can consider this option with regard to default assumptions about the boundaries for net pen farms.</p> <p>PC2: AZE and discharge into waterbodies are proposed to be assessed in Effluent.</p> <p>FINAL: Changes to the standard have been made. Effluent criterion evaluates soluble and insoluble impacts near and far, while Habitat assess the physical siting of farms and any cumulative impacts.</p>
1	<p><u>Appendices: Habitat examples</u> Add some guidance on the use of sulphides, redox or other common parameters in benthic assessments.</p>	<p>PC1: We can consider incorporating more clarifying language and guidance into the appendices for this criterion.</p>



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		<p>PC2: Impacts to the benthos are proposed to be assessed in the Effluent criterion.</p> <p>FINAL: Changes to the standard have been made. Effluent criterion evaluates soluble and insoluble impacts near and far, while Habitat assess the physical siting of farms and any cumulative impacts. Further guidance on habitat impacts can now be found in Appendix 1.</p>
1	<p>SeaChoice suggests both the immediate (within the farm boundary or an AZE) and the regionally impacted habitat should be assessed. For the latter, cumulative impacts can be more suitably assessed - currently a deficiency of the criteria. We recommend the cumulative habitat impact of all aquaculture operations within a given area/zone - not just the species being assessed - should be addressed through management/regulatory criteria.</p>	<p>PC1: We are considering the addition of a Management criterion, as well as expanding the scope of our definition of “impacted habitat.”</p> <p>PC2: Impacts to the water column, benthos and beyond farm boundaries and discharge points have been considered in the latest version of the standard.</p> <p>FINAL: Changes to the standard have been made. Effluent criterion evaluates soluble and insoluble impacts near and far, while Habitat assess the physical siting of farms and any cumulative impacts. Further guidance on habitat impacts can now be found in Appendix 1.</p>



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1	<p>Both this criterion and C2 (Effluent) have long been challenged by the fluid definition of "scale" used in the SFW methodology. Without a clearly defined unit of assessment, it is difficult to accurately assess impact because it is so tightly tied to the scale of the industry. One very poorly sited farm is unlikely to impact the functionality of an ecosystem (so a farm-level assessment is likely to score well on this criterion no matter what). On the other hand, defining 'habitat' to within the farm boundary or an AZE fails to account for the cumulative impacts of multiple farms in one area.</p> <p>The current delineation of within the boundary of the farm vs beyond an AZE was largely driven by a debate during the last Standard Revision process about the impact of soluble and insoluble effluent from net pens. Although the resulting differentiation between C2 and C3 (within vs beyond the AZE) is valid, it definitely reduces the standards ability to effectively assess the physical impact of siting farms on habitat functionality in C3.</p> <p>For C3 we would suggest that it is critical for this criterion to consider the broader habitat in which the farm(s) are sited. Criterion C2 should assess the impact of effluent (soluble and insoluble) on the farm site and beyond (if applicable). While C3 should focus on assessing the impact to habitat from the physical siting of farm(s) and cumulative impact to habitat functionality. SeaChoice suggests both the immediate (within the farm boundary or an AZE) and the regionally impacted habitat should be assessed. For the latter, cumulative impacts can be more suitably assessed - currently a deficiency of the criteria. We recommend the cumulative habitat impact of all aquaculture operations within a given area/zone - not just the species being assessed - should be addressed through management/regulatory criteria.</p>	<p>PC1: We are considering incorporating scoring elements by which to assess the scale of an impact in an assessment. We are also considering better defining the unit of assessment.</p> <p>PC2: We agree and have proposed this moving forward.</p> <p>FINAL: Changes to the standard have been made. Effluent criterion evaluates soluble and insoluble impacts near and far, while Habitat assess the physical siting of farms and any cumulative impacts. Further guidance on habitat impacts can now be found in Appendix 1.</p>
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CRITERION 4: CHEMICAL USE		
GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE



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1&2	<p>In the last public consultation, SeaChoice submitted the following: "Any illegal use should result in a critical score. Otherwise there is the possibility that aquaculture operations with illegal activities are able to receive an overall 'buy' (i.e. yellow) recommendation. Include ineffective/no regulations as a score of '0'." SFW responded with, "We will consider this in reviewing the scoring for this criterion." Again, we strongly recommend SFW consider these additional scoring changes.</p>	<p>FINAL: Seafood Watch has determined that illegal use will remain in the qualifications for a score of '0', which results in a red criterion. The overall intent of the chemical use criterion is to assess the cumulative ecological impacts of chemical use during production, and thus the 'critical' score is reserved for evidence of these impacts. Illegal use itself does not necessarily directly result in an ecological impact, but illegal use with demonstrable, persistent, negative environmental impact does/will result in an overall Avoid recommendation.</p>
2	<p>- The differentiation in the 'High' and 'Critical' scores of 'chemicals highly important to human health', 'chemicals critically important to human health', 'antimicrobials important to human health', and 'antimicrobials critical to human health' are confusion and the links in the footnoted definitions all lead to a general FAO landing page. Please provide more direct links to the definitions of these criteria.</p>	<p>FINAL: Thank you for your comment; we have ensured the links are more specific to reduce confusion in interpretation for these terms.</p>
2	<p>- We note that you specified the "clinical resistance" throughout this criteria, but have not provided a definition of this. Please include a definition for clarity.</p>	<p>FINAL: We have provided a definition of: "a level of antimicrobial activity associated with high likelihood of therapeutic failure; typically evidenced by a documented reduced efficacy of treatment."</p>
2	<p>Chemical use must be assessed at the farm level. There is several factors affecting chemicals use, and impact is very different.</p>	<p>FINAL: Our standards aim to assess the cumulative impact of a given indicator. Farm-level information is indeed</p>



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		important, and used, for understanding the use at an industry scale.
2	We recommend to not only assess the direct use of chemicals but also indirectly entering contaminants such as PCBs, dioxins, heavy metals etc. included in some feed components such as fish oil and fish meal. These contaminants also influence fish health and thereby animal welfare.	FINAL: We agree that contaminant levels are a concern for consumers and for animal welfare. However, the scope of our standards encompasses the ecological impacts of farm practices and therefore consumer and animal welfare are not currently considered. If fish health is compromised as a result of feed contaminants, the result would be captured in Criterion 7 – Disease.
1	There is no concern about the actual necessity of the use of chemicals. Preferably used chemicals should be based on prescription or (at least) a health plan Trend adjustment: Maybe use a defined significance here to use as an indicator for positive trend adjustment	FINAL: The responsible management and use of chemicals – such as only administering them upon prescription and abiding by a health plan – are covered in Criterion 4. Trend adjustments are based on duration, rate and confidence in the reduction of chemical use.
1	Reconsider some of the scoring definitions in light of current thinking on targets and Limit Reference Points. For example currently in a score of 6 is: "Evidence of only minor impacts on non-target species within the allowable zone of effect (i.e. no population-level impacts). With consideration of limit reference points and sustainable impacts, this appears to be a very minor impact that justifies a higher score than 6.	PC1: We will consider this in reviewing the scoring for this criterion. PC2: These definitions were reviewed and the outcomes are indicated as 'tracked changes' in the Public Comment 2 version of the document



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		<p>FINAL: With a score of 10 being a nearly-zero risk of impact because of no chemical use or no release of chemicals to the environment, and a score of 8 being “evidence of no impacts to non-target organisms”, it is appropriate for a 6 to be achieved when there is “occasional, temporary, or minor evidence of impacts to non-target organisms beyond an allowable zone of effect.” This reflects that there may still be significant impacts to non-target organisms in proximity to the farm site and that impacts somewhat distant to the farm are apparent, if only occasional, temporary, or minor. Particularly with consideration to the cumulative impact of chemical use and the generally-poor understanding of how an entire industry’s use of chemical impacts the receiving environment, we are confident in the level of impact that achieves a score of a 6 out of 10.</p>
<p>Criterion 4 – Risk- and Evidence -Based Assessments Should there be an option for a risk-based and an evidence-based assessment method for this criterion? Which factors, metrics, and outside research or literature sources should be included?</p>		
PERIOD	COMMENT	RESPONSE



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1	<p>Risk based framework is good in theory, but "impacts" needs to be clearly defined. This option will reward farms for using the most appropriate and effective treatments (as stated in the previous comment)- e.g. antibiotics that are better absorbed compared to those that are lost to the environment, rather than simply penalizing the number. Environmental monitoring (sea bed sampling for residues, for example) and other robust data needed to ensure that environmental impacts are not occurring.</p>	<p>PC1: We will consider this in reviewing the scoring structure for this criterion.</p> <p>PC2: We have considered developing a guidance table to further clarify risks of impacts. We will continue to explore this topic as we continuously review our standards.</p> <p>FINAL: We have decided to keep a single scoring table which has both risk-based and evidence-based elements. Where evidence robustly demonstrates that chemical use on-farm and, more importantly, across the cumulative industry does not have an ecological impact, Criterion 4 will score well.</p>
1	<p>SeaChoice supports a risk-based assessment option given that chemical/antibiotic usage data are largely unavailable for many producer countries (particularly for shrimp). The lack of data is the reason why we believe including 'PUBLICLY available' data in the descriptor requirements for Criterion 1 (Data) would help to leverage greater transparency.</p>	<p>PC1: We will consider this in reviewing the scoring structure for this criterion.</p> <p>PC2: For assessments, a mix of publicly available data and public upon publishing is used. This is necessary due to the lack of publicly available data, and all information is weighted and justified in the report.</p>



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		FINAL: We have decided to keep a single scoring table which has both risk-based and evidence-based elements.
1	<p>Factors that should be included are:</p> <ul style="list-style-type: none"> - Whether producing countries have chemical regulations - Whether these regulations are stringent, effective and are monitored and enforced - Whether chemical/antibiotic use is required to be reported (i.e. date of use, type and amount) - Whether illegal use has occurred - Whether resistance (antibiotic, parasiticide, bacteria, etc) has been documented - Whether WHO critically or highly important antibiotic use is used - Whether used as prophylactic or for growth - Whether used with veterinarian oversight and prescription only <p>Given the limited data available, evidence can be obtained from US FDA import tests (or equivalent importing country regimes) and scientific regional farm studies.</p>	<p>PC1: We will consider this in reviewing the scoring structure for this criterion. Currently, all of the listed factors are, if data are publicly available, considered in the scoring for this criterion.</p> <p>PC2: Thank you for your comment, and all of these listed factors are used in the analysis of this criterion.</p> <p>FINAL: As above.</p>
1	<p>It seems easy to split the content into the current table into two separate assessments, but I'm not sure what would be gained. Maybe additional aspects could be added to each. This is another area where there is an almost complete lack of widely accepted reference points for sustainable or acceptable impacts. The terminology in this criterion is challenging. "Evidence of no impacts" for a score of 8 seems to deserve a score of 10. "No population-level impacts" in a score of 6 is also too vague. What is a "population-level" impact, and surely some substantial population-level impacts to non-target species can still be considered fully sustainable in a "fisheries - MSY" target-reference-point concept. By all means split the criterion into two. Consider adding indirect evidence of impacts into the evidence-based assessment as suggested for C2 on the basis of a suitable level of</p>	<p>PC1: We will consider this in reviewing the scoring structure for this criterion.</p> <p>PC2: We are working on developing guidance for risk- based assessments.</p> <p>FINAL: We have decided to keep a single scoring table which has both risk-based and evidence-based elements. We will continue to evaluate options for more</p>



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	confidence in the likely impacts, even in the absence of direct "data" from the assessed sites (i.e. as we do now for the use of hydrogen peroxide - we have no data about specific impacts, but we have sufficient confidence that it doesn't cause a major problem.	robustly assessing and scoring the use – and particularly the ecological impact – of chemicals in aquaculture, and hope additional research provides us with the information to do so.
1	Generally speaking a differentiation in evidence based and risk based evaluation sounds reasonable. Criteria should be similar to Number 2 (Effluents) (based on the data availability for data concerning chemicals)	After Public Comment Period 1, the Seafood Watch team considered a risk-based and evidence-based framework for this criterion. The outcome of this work resulted in a refined scoring table for Criterion 4, without further splitting into risk- and evidence-based options. FINAL: We have decided to keep a single scoring table which has both risk-based and evidence-based elements.
2	Criterion 4 – For a score of 10 out of 10, the specification that data show chemical treatments have not been used over 3 or more consecutive production cycles.	
PERIOD	COMMENT	RESPONSE
2	Re: 3 or more consecutive production cycles. Please explain how '3' was determined as the acceptable threshold?	This threshold is based upon outcomes from expert working groups for several other aquaculture sustainability standards. We've inserted a footnote into the standard to reflect this. FINAL: After input from our Multi-Stakeholder Group, we have further refined this requirement. It now reads:



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		<p>“The data score for chemical use is 7.5 or 10 of 10 and data show that chemical treatments have not been used for the most recent three consecutive production cycles or three consecutive years for cycles longer than one year, and the species or production system has a demonstrably low need for chemical use.”</p>
2	<p>1.-For scoring define compliance criteria at regional or national level. 3 not used treatment as a average?</p>	<p>This threshold is based upon outcomes from expert working groups for several other aquaculture sustainability standards. We’ve inserted a footnote into the standard to reflect this.</p> <p>FINAL: After input from our Multi-Stakeholder Group, we have further refined this requirement. It now reads: “The data score for chemical use is 7.5 or 10 of 10 and data show that chemical treatments have not been used for the most recent three consecutive production cycles or three consecutive years for cycles longer than one year, and the species or production system has a demonstrably low need for chemical use.”</p>
2	<p>Criterion 4 – Additional Factors for Chemical Use Scoring In the table below, are there any key factors of chemical use or the ecological impact (or lack thereof) of chemical use that are currently missing? Are there any factors that can be expanded upon?</p>	
PERIOD	COMMENT	RESPONSE



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1	<p>Current production may fall into a number of categories, and current scoring does not accurately reflect the decisions made around which chemicals to use and what times. Clarification around treatment type should also be made- for example, does one antibiotic treatment and one parasiticide treatment in a cycle constitute "multiple occasions"? With other appropriate controls in place, this situation is extremely unlikely to result in development of resistance or other environmental concerns. Also, as mentioned above, use of H2O2 should be clarified to not penalizing the score. In instances where development of resistance to H2O2 has been found, this should be accounted for in the evidence based scoring, rather than in total treatment number.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>PC2: We are currently evaluating how to define treatments. Evidence of resistance is a factor for scoring this criterion.</p> <p>FINAL: The number of chemical treatments is specific to the class of chemicals; for example, one antibiotic treatment and one pesticide treatment is considered one treatment. In practice, if an industry averaged one antibiotic treatment per cycle but three pesticide treatments per cycle, the scoring would weigh those performance outcomes and the use of pesticides would be a significant driver of the score. The use of hydrogen peroxide is mentioned specifically in the Background and Rationale section as not posing a significant ecological threat because of its rapid dissociation upon contact with water into elemental oxygen and water molecules. And finally, the presence or absence of resistance to any single or combination of chemical products is accounted for and influences the scoring accordingly.</p>
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1	<p>Any illegal use should result in a critical score. Otherwise there is the possibility that aquaculture operations with illegal activities are able to receive an overall 'buy' recommendation. Include ineffective/no regulations as a score of '0'.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>PC2: The environmental impact is driving the scoring and illegal use is a component but currently the combination of illegal use and environmental impacts can result in a critical score.</p> <p>FINAL: Seafood Watch has determined that illegal use will remain in the qualifications for a score of '0', which results in a red criterion. The overall intent of the chemical use criterion is to assess the cumulative ecological impacts of chemical use during production, and thus the 'critical' score is reserved for evidence of these impacts. Illegal use itself does not necessarily directly result in an ecological impact, but illegal use with demonstrable, persistent, negative environmental impact does/will result in an overall Avoid recommendation.</p>
2	<p>Criterion 4 – While the use of antimicrobials critically important for human medicine in significant quantities (usually defined as more than once per production cycle) remains at a score of 0 out of 10, the use of those products in unknown quantities is now considered a 'Critical' conservation concern.</p>	
PERIOD	COMMENT	RESPONSE



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2	<p>We support the change of unknown quantities to be considered 'Critical'.</p>	<p>Thank you for your comment.</p> <p>FINAL: After input from our Multi-Stakeholder Group, we have further refined these scores. They are now as follows: Score 2/10: Use of highly important antimicrobials in significant quantities Score 0/10: Use of highly important antimicrobials in unknown quantities Score Critical: Use of critically important antimicrobials in significant or unknown quantities.</p>
2	<p>- The rationale for the stepped scoring of the following is unclear: > Score 2 reads "Antimicrobials highly important to human health³³ are being used in significant³⁴ or unknown quantities." > Score 0 reads "Chemicals critically important to human health are being used in significant or unknown quantities," > Score Critical reads "Antimicrobials critically important for human medicine are being used in unknown quantities."</p> <p>In the above, is the overuse of general 'chemicals' a lesser concern than the overuse of antimicrobials? even if both are considered critically important to human health?</p>	<p>Thank you for bringing this to our attention; we've modified the language a bit more for clarity based on these suggestions.</p> <p>FINAL: After input from our Multi-Stakeholder Group, we have further refined these scores. They are now as follows: Score 2/10: Use of highly important antimicrobials in significant quantities Score 0/10: Use of highly important antimicrobials in unknown quantities Score Critical: Use of critically important antimicrobials in significant or unknown quantities.</p>



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		In addition, our use of “critically important to human health” is in reference to the World Health Organization’s published list of, specifically, antimicrobials that are highly or critically important for human health.
2	Criterion 4 – We would like to insert more clarifying guidance on the definition of a ‘single treatment’ and are seeking public comment on this definition. Please see highlighted footnote in the scoring table.	
PERIOD	COMMENT	RESPONSE
2	Single treatments should be defined as individual outbreaks, continuing treatment for the same outbreak (within a time period of 2 weeks, for example) should not count as a second treatment.	Thank you for your comment; we’ll take this into consideration as we work to define a ‘single’ chemical treatment. FINAL: We have defined a single treatment as: “a single course of medication given to address a specific disease issue and that may last a number of days. For sites with multiple production units, the number of treatments is scoped to the unit that treatment courses are administered and which have their own production cycle.”



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2	<p>Concern around chemical use is the impact on non-target organisms, development of resistance, etc. but all scoring is based on total number of treatments. There should be allowance under this criterion to use more treatments if evidence shows that non-target organisms are not affected and resistance is not developing.</p>	<p>Thank you for your comment; we'll take this into consideration as we work to define a 'single' chemical treatment.</p> <p>FINAL: The scoring table does indeed allow for evidence of no impact resulting from chemical use to score well. The use of this evidence is preferable to relying solely on the knowledge that chemicals are used.</p>
2	<p>- Definition for Single Treatment should be once per production cycle. Remove the "once per year for longer production cycles" language.</p>	<p>Thank you for your comment; we'll take this into consideration as we work to define a 'single' chemical treatment.</p> <p>FINAL: We have defined a single treatment as: "a single course of medication given to address a specific disease issue and that may last a number of days. For sites with multiple production units, the number of treatments is scoped to the unit that treatment courses are administered and which have their own production cycle." Given that some species have production cycles that are, for example, a 2-3 months (shrimp) and some are 14-18 months (salmon), restricting the metrics for chemical use to solely per-production-cycle would be</p>



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		an inconsistent and inadequate approach.
2	3- considering criteria based in GSI indicator. Antibiotic use has been calculated as number of treatments over entire production cycle at a site level.,That mean cage by cage treatment is not a whole treatments. 1 mean a entire site tratments. 0,3 mean 30% of cage was treated.	<p>Thank you for your comment; we'll take this into consideration as we work to define a 'single' chemical treatment.</p> <p>FINAL: We have defined a single treatment as: "a single course of medication given to address a specific disease issue and that may last a number of days. For sites with multiple production units, the number of treatments is scoped to the unit that treatment courses are administered and which have their own production cycle." In practice, if the data we have are granular enough to demonstrate a cage-based treatment regime, we have and will follow that approach.</p>
2	Criterion 4 Question 4 – Guidance for polyculture assessments has been inserted into the assessment guide.	
PERIOD	COMMENT	RESPONSE
	<i>no comments received</i>	
2	Criterion 4 request for comment – There are clearly differences in impacts and risks of impacts associated with chemical use, depending on a number of factors (e.g. products, species, production system, region). Data regarding these impacts are generally poor, which can be a constraint when writing Seafood Watch assessments.	



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	We are considering developing a guidance table that could clarify some of the risks of impacts and are seeking input on suggested content for this proposed guidance table.	
PERIOD	COMMENT	RESPONSE
2	Differentiation based on the chemical used (i.e. florfenicol is used at a much lower dose and absorbed at a significantly higher rate than oxytetracycline) should be built into the scoring table.	<p>Thank you for your comment; we'll take this into consideration as we build in further guidance for this criterion</p> <p>FINAL: The development of a comprehensive and robust guidance table that accounts for product toxicity and its impact under a variety of treatment regimes, neutralization strategies, geographies, and environmental conditions is a significant undertaking, and we aim to assemble an expert working group to assist us; we will be actively pursuing this in the coming months and years.</p>
	<p>Should include evidence of the use of permitted vrs prohibited substances as per national regulations (lists of which are generally readily available), plus evidence of enforcement and penalties for the use of prohibited substances.</p> <p>Evidence of promotion/increase in use of non-chemical treatments, both biological and mechanical. Note that use of biological (cleaner fish) raises further sustainability and fish-welfare issues.</p>	<p>Thank you for your comment; we'll take this into consideration as we build in further guidance for this criterion. The permitted and prohibited use is currently included in the standard. Cleaner fish are proposed to be considered as a polyculture species in the inserted guidance.</p>



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		<p>FINAL: The legality of chemical use, the enforcement of chemical use regulations, and the ecological impacts of chemical use that is illegal, are all already components of our scoring. Where non-chemical strategies replace the use of chemical therapeutants, they inherently positively impact on the score for Criterion 4. And indeed, the use of wild-caught cleanerfish is now within the scope of Criterion 8X – Source of Stock.</p>
	<p>The data availability could be highly increased by assessing at farm level.</p>	<p>FINAL: Our standards aim to assess the cumulative impact of a given indicator. Farm-level information is indeed important, and used, for understanding the use at an industry scale.</p>
	<p>Please check the links to the list of critical and highly important antimicrobials. A new list is available since 2019.</p> <p>https://apps.who.int/iris/bitstream/handle/10665/312266/9789241515528-eng.pdf?ua=1</p>	<p>Thank you for your comment; we'll ensure this link is updated in our standard.</p> <p>FINAL: We have updated the link. As a note, as the WHO publishes new versions, they are indeed referenced in Seafood Watch assessments even if the link in the Standard is not.</p>



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CRITERION 5: FEED		
GENERAL COMMENTS		
<p><i>NOTE: FOR ALL FEED COMMENTS, THE AQUACULTURE TEAM IS CURRENTLY FORMULATING A RESPONSE, CONTINGENT UPON FURTHER INTERNAL DISCUSSION AND FURTHER DISCUSSION WITH TAC MEMBERS.</i></p>		
PERIOD	COMMENT	RESPONSE
1	We recommend that the nutrition-centric direction proposed by the authors [Turchini et al. 2019] be adopted in your rankings to recognize the on-farm utilization of feed formulations that strive to achieve appropriate nutrition rather than focusing on fish meal or fish oil as an indicator for sustainability. Farms should be recognized for utilizing compounded feeds appropriate for their aquatic animal and production system.	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: We did not adopt a nutrition-centric metric for this Criterion, as the use of a nutritionally-appropriate feed for an aquaculture species is not necessarily an ecologically-sustainable feed or process. Farms will be recognized for utilizing compounded feeds that have low ecological footprints.</p>
1	Because of its urgency and widespread impact, we recommend that MBAYAQ weight feed sustainability and within that FM/FO reduction, more highly.	PC1: We will consider this in reviewing the scoring for this criterion.



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		FINAL: We have implemented a new scoring table for Factor 5.1 which more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability.
1	<p>We propose that assessments of ‘green’, ‘yellow’ and ‘red’ occur by aquacultured species since different species have differing needs for FM/FO in aquaculture. A feed’s sustainability makes most sense in relation to industry averages for inclusion by species.</p> <ul style="list-style-type: none">○ If FM/FO inclusion rates are above average FM/FO inclusion rates, then the feed should be rated red, and the aquacultured species could then not be higher than yellow.○ If FM/FO inclusion rates are within 7% above the industry average, then the feed would be rated yellow.○ If FM/FO inclusion rates are less than the industry average 7%, then the feed would be rated green.	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: This proposed change is not clear, but if we understand properly, feed sustainability will not be measured on this type of relative basis (e.g. scoring Criterion 5 of a ranched bluefin tuna with an FFER of 4 Green because it is >7% below the bluefin industry average of 12).</p>
1	<p>Since forage fish are at the base of the food chain, and the health of this fishery affects the health of many sectors of the ocean, we recommend that if feed sustainability in terms of</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p>



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	<p>FM/FO usage for a company is red, then we propose that aquacultured species produced with red feed cannot be green.</p>	<p>FINAL: This is already how the Standard decision rules operate; if Criterion 5 is Red, the overall rating is Red with an “Avoid” recommendation. The FFER is one of several factors used in assessing Feed sustainability.</p>
1	<p>We also recommend that the goalposts for ‘green’, ‘yellow’ and ‘red’ be reduced by 7% each year to encourage greater FM/FO reductions in time to avert a ‘business as usual’ deadline of 2037. If this is done, by 2037 when the fishery is expected to collapse, FM/FO inclusion is reduced by 74%. A 7% reduction each year may restore current levels of forage fish to sustain other species in the environment and also to avoid decline (See Appendix B). We recommend notifying the aquafeed industry, that sustainability ratings will change annually on a schedule so that they can include sustainable ingredients in feed in their planning processes, and implement these as goals for R&D, supply chain and production.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: We have implemented a new scoring table for Factor 5.1 which more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability. We will consider raising the bar even further during our next Standard Review. Regardless, this comment is based on a core misunderstanding of Froehlich et al. (2018) that forage fisheries will collapse in 2037; the paper asserts that we will reach the maximum sustainable yield of forage fisheries</p>



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		in 2037 under a business-as-usual scenario, not that forage fisheries will collapse.
1	We recommend and suggest that krill substitution and replacement should also follow a schedule similar to the above. Staving off overfishing of forage fish will go a long way towards addressing overfishing since an estimated 50%+ of all wild fish mortality is the result of aquafeed production (http://tinyurl.com/yxqrxbsl)	PC1: We will consider this in reviewing the scoring for this criterion. FINAL: Krill meal and krill oil are considered as fishmeal and fish oil inclusions. The estimate of 50% of all wild fish mortality is caused by aquaculture feed production is based on a number of assumptions that cannot be made together and is not considered.
2	It is possible to reduce the complexity of the use of different feed ingredients by measuring the 3 proposed impacts. Hence, the proposed approach seems logical.	Thank you for your comment.
1	Due to the rapidly rising supply of alternative feed ingredients such as insect meals, algae oils etc. we recommend to broaden the types of ingredients beyond marine ingredients, crops and from land animals. Moreover, the innovative nutrient sources require new criteria for the evaluation of sustainability. The scientific state-of-the-art recommends the fishery-related metrics FFDR,	FINAL: The feed criterion has been finessed a bit further to incorporate alternative feed ingredients in an equitable manner using the best available science.



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<p>PPR, SSD and OF. Therefore, the current metrics in the Standard should be reassessed and augmented to encourage the replacement of fish oil and fish meal.</p> <p>Since animal welfare is also an important sustainability issue, we recommend to include fish health in the standard. A low level of contaminants (PCB, dioxins, heavy metals, ethoxyquin etc.) and a well-balanced nutrient provision, i.a. of the omega-3 fatty acids EPA and DHA, should be ensured.</p> <p>Looking at the subfactor net protein gain or loss it is to be mentioned that fish is not only a source of animal protein but also of fatty acids, vitamins and other essential nutrients (Beveridge et al. 2013; Kawarazuka and Béné 2011; WOR2 2013). Currently levels of EPA and DHA have been falling in farmed salmon (Jackson and Newton, 2016). Therefore it could be considered to move from a net protein gain or loss consideration to a net valuable nutrient gain or loss consideration.</p>	<p>We have expanded Factor 5.3 to include all ingredients in a calculation of the embedded feed global warming potential in 1 kg of farmed seafood protein, so alternative ingredients are now included and assessed where data are available.</p> <p>We have also implemented a new scoring table for Factor 5.1 which more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability, further encouraging the replacement of FMFO with low impact alternatives.</p> <p>The scope of our current Standard is limited to ecological impacts, and as such, we did not include provisions related to animal welfare or human nutrition; however, the metrics by which we measure ecological impact of feed, such as net protein</p>
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		gain/loss, may be adjusted as data become available (e.g. net nutritional values of feed, nutritional values of farmed seafood products). The current use of protein as an indicator is due to the fact that protein content of feed is a readily available data point, as well as estimates of the whole harvested fish protein content. Using nutritional conversion as a metric is considerably more complex, and is on our radar for the next Standard Review.
	To also give farmers and feed producers examples for new and effective alternatives or supplements to fish oil, we recommend to add a table with examples for lipids and their nutritional value. This table should include alternative feed ingredients such as algal oil.	FINAL: The Aquaculture Standard is not a recommendations document for improvement; however, we will consider the development of materials related to improving Criterion 5 scores when engaging with industry.
1	For (most) other indicators the score 'Critical' is separate from the numerical score. Why is this not the case with feed?	FINAL: 'Critical' is separate from a numerical score of '0' for factor 5.1 with regard to the sustainability of wild fish use in feed.



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		<p>Since many of the calculations involved in Criterion 5 are mathematical, the “Critical” score is assigned to several numerical results within the Factors, indicating significant ecological impacts. The Critical score is separate from numerical scores in Factor 5.1b, where qualitative information regarding fishery sustainability is included in the assessment. Other criteria in the Standard are scored using a mix of qualitative and quantitative information, thus the Critical scores are able to be separated from numerical scores, like Factor 5.1b.</p>
1	<p>Criterion 5 Question 1 – Assessing Alternative Feeds <i>How should Seafood Watch incorporate alternative feed ingredients into the feed assessment, and by which metrics should they be assessed? Please consider all potential impact areas contained in the current criterion - sustainability of the source, protein efficiency, and feed footprint – and other impact areas that may be relevant</i></p>	
PERIOD	COMMENT	RESPONSE



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1	There is tremendous effort in reducing the inclusion of FM/FO in the feed, because it is expensive. Sourcing protein should be mainly responsible and/or via alternative means, algae/insects	PC1: We will consider this in reviewing the scoring for this criterion. FINAL: Thank you for your comment. The changes we've made to the Standard continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the impacts of the alternative ingredient.
1	yes, recognition of "alternative" feed ingredients	PC1: We will consider this in reviewing the scoring for this criterion. FINAL: Thank you for your comment. The changes we've made to the Standard continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of



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		FMFO without consideration of the impacts of the alternative ingredient.
1	Use similar scoring system to fisheries criteria	PC1: We will consider this in reviewing the scoring for this criterion. FINAL: Thank you for your comment. The Source Fishery Sustainability table includes reference to SFW ratings of wild fish.
1	It will be difficult to compare feeds against one another unless feed manufacturers are willing to make formulations publicly available.	PC1: Seafood Watch has found that feed manufacturers are indeed willing to make formulations publicly available, provided that the data is anonymized and/or aggregated.
1	For simplicity, all alternate ingredients should be scored in the same way as other non-marine ingredients based on their feed footprint. To the extent that they have specific beneficial functions or are more effective as substitutes for traditional marine ingredients, those benefits can be recognized via their impact on the FFER score, which they indirectly contribute to.	PC1: We will consider this in reviewing the scoring for this criterion.



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		<p>FINAL: Thank you for your comment. The new Factor 5.3 assesses the embedded feed global warming potential in one kg of farmed seafood protein. All ingredients are considered and assessed in this calculation, inclusive of marine and non-marine ingredients. Indeed, a reduction in FMFO through adoption of alternative ingredients will result in better scores in Factor 5.1.</p>
1	<p>As a first order principle, use of alternative ingredients should contribute to a reduction in the fish-in, fish-out (FIFO) ratio of the final farmed species. Ideally, the ingredient should help to achieve a net positive fish production system. The Aquaculture Standard should reduce the target FIFO ratio to 1:1 for all species and aim for a lower FIFO in subsequent standard revisions.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. The changes we've made to the Standard continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the</p>



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		impacts of the alternative ingredient.
1	Currently, the Seafood Watch standard considers the feed footprint for 3 sources of feed ingredients: aquatic, crop and land animals. The emergence of alternative feed ingredients offers new sources of nutrient dense ingredients often produced with lower environmental impact. The metrics to assess these ingredients should be similar to the metrics used to assess their land-based analogues.	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. The changes we've made to the Standard continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the impacts of the alternative ingredient. The new Factor 5.3 assesses the embedded feed global warming potential in one kg of farmed seafood protein. All ingredients are considered and assessed in this calculation, inclusive of marine and non-marine ingredients.</p>



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1	<p>Currently, Seafood Watch assesses crop-based ingredients on a land use metric with assurances to protect high conservation value areas. If Seafood Watch adheres to this metric, then this should be applied to alternative ingredients. For microalgae and single cell proteins produced through fermentation, the land use metric would be applied to the production of feedstock (e.g., sugar). However, there are new sources of feedstock for alternative ingredients that are not dependent on land use, for example, food waste for insects and natural gas or waste gas as feedstock for some microorganisms.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. We have changed Factor 5.3 from a land-use metric into an embedded global warming potential of feed applied to produce one kg of farmed seafood protein. The global warming potential is inclusive of land-use change, and references the database developed by the Global Feed Lifecycle Institute. Data points in this database are the result of studies that follow aligned LCA methodology requirements; footprints associated with feedstocks and other material inflows are dependent on the boundaries set by the original studies that fed into the database.</p>
1	<p>This prompts the question as to whether CO2e impact should be added as a metric. Assessing CO2e impact requires a great deal of scientific rigor and investment by Seafood Watch. An initial step to address the environmental impacts beyond land use could be to</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p>



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	<p>require transparency about the feedstock and source of energy used to produce these new ingredients. These two inputs provide important insight into the carbon, water and land use impacts of producing alternative ingredients.</p> <ul style="list-style-type: none"> ○ Feedstock – the feedstock source should be stated, region of origin, and if it is a crop, whether it is from a genetically engineered crop <p>Energy use – state the type of energy used in the ingredient production facilities (e.g. natural gas, grid electricity, renewable energy, etc.)</p>	<p>FINAL: Thank you for your comment. Indeed, we have structured the new Factor 5.3 to be a measure of the embedded global warming potential (CO₂-eq inclusive of land-use change) in feed applied to produce one kg of farmed seafood protein. Data to inform this Factor are ingredient composition of feed applied, eFCR, and whole harvested seafood protein content; ingredient composition is mapped to the Global Feed Lifecycle Institute database, which contains values of CO₂-eq inclusive of land-use change for over unique 1,000 ingredients, and a value of “kg CO₂-eq kg-1 farmed seafood protein” can be determined.</p>
1	<p>All these ingredients (insect meals, single-cell, algal etc) are directly (or potentially) suitable for human consumption and are consumed at their current societal limits (i.e. we choose to eat them or not to eat them based on variables other than their availability). This is exactly the same as peruvian anchovy or many other "forage" fish. If a sustainable excess can be produced/harvested (i.e in excess of current direct human consumption requirements) then it makes sense to use them efficiently to produce fish. However, the</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p>



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	<p>definition of "sustainable", particularly for forage fish, is highly controversial from an ecosystem perspective. Arguably therefore, insect meals or fermented/industrial protein meals or oils is more "sustainable" (accepting that they also require feed inputs and substrates etc).</p>	<p>FINAL: Thank you for your comment. The changes we've made to the Standard continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the impacts of the alternative ingredient.</p>
1	<p>They should not be scored in Factor 5.1. If they are demonstrably edible, then they can be scored in Factor 5.2, otherwise consider as we already do for non-edible crops/land animals. They could in theory be scored in Factor 5.3 if an approximate crop input factor (or range of factors for different ingredients) could be calculated for the typical substrates used to culture the ingredients.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: We have removed edible/inedible provisions from Factor 5.2, please see the updated Background and Rationale. Alternative ingredients are assessed indirectly in Factor 5.1 via offsetting FMFO inclusions, directly in Factor 5.2 through their contributions to the protein content of the feed applied, and directly in Factor 5.3 in</p>



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		<p>an assessment of the embedded global warming potential in feed applied to produce one kg of seafood protein.</p>
<p>1</p>	<p>Due to the innovative alternative feed ingredients entering the aquaculture market, the sustainability evaluation metrics of the Feed Criterion in the Standard should be reassessed and augmented to encourage a sustainable replacement of fish oil and fish meal. The scientific state-of-the-art recommends the following fishery-related metrics:</p> <p>Primary production of photosynthetic carbon required (PPR) is a good indicator for the sustainability of marine resource utilization, to reflect the disturbance of the ecosystems and quantify biotic impacts:</p> $PPR = \sum(Y/9) \times (1/TE)^{(TL-1)}$ <p>=> unit: kg carbon per FU (1,000 kg aquaculture salmon live weight); Y = landings = catches - discards, TL = trophic level, 9 = conversion ratio of weight of fish to carbon, TE = ecosystem transfer efficiency</p> <p>Sea surface dependency (SSD) measures the surface area on the ocean necessary for producing the required biomass through photosynthesis in one year:</p> $SSD = PPR / PP$ <p>=> unit: m²a per FU (1,000 kg aquaculture salmon live weight), PP=primary production</p>	<p>FINAL: The feed criterion has been adjusted to incorporate alternative feed ingredients in an equitable manner using the best available science.</p> <p>If an alternative ingredient is utilized for replacing fish meal or oil, this will automatically be excluded from the calculation of the FFER. These ingredients are explicitly mentioned in the background and rationale section of the criterion and are most recognizably incorporated into Factor 5.3.</p> <p>Alternative ingredients are assessed indirectly in Factor 5.1 via offsetting FMFO inclusions, directly in Factor 5.2 through their contributions to the protein content of the feed applied, and directly in Factor 5.3 in an assessment of the embedded</p>



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	<p>The Overfishing through fishing mortality (OF) represents how many kilos of fish have currently been caught too much related to a ton of seafood:</p> <p>OF = $\text{Max}\{0, (F/\text{FMSY}-1)\} * \text{landing per FU}$</p> <p>=> unit: kg per kg landed; FMSY = maximum rate of fishing mortality, F = current fishing mortality rate, FU = 1,000 kg aquaculture salmon live weight</p> <p>The use of alternative feed ingredients would automatically be rewarded by these metrics. However, we suggest to explicitly mention algal oil and other alternative feed ingredients as a sustainable means to reduce the FFER.</p>	<p>global warming potential in feed applied to produce one kg of seafood protein.</p>
1	<p>Criterion 5 Question 2 - Role of the Sustainability of the Source of Wild Fish <i>Should sustainability in marine ingredients play a larger role in the Seafood Watch standard? Should the sustainability in sourcing outweigh the overall use of FM/FO?</i></p>	
PERIOD	COMMENT	RESPONSE
1	<p>Yes, sustainability of products will vary depending on the source of the feed.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. Please see the Source</p>



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		Fishery Sustainability Table in Factor 5.1b.
1	yes, sustainability of marine ingredients should play a larger role in the weighting of the overall 5.1 score. Yes, the sustainability in sourcing should outweigh the overall use of FM/FO (i.e. even if you are using a small amount of fish from a critically endangered fishery that should result in a red score); however, if there is evidence of improvement efforts in that fishery then that should be credited. As such, we suggest that FIPs be included in the Fishery Sustainability table as follows: > FIP with progress rating D-E gets scored -8; > FIP with progress rating A-C gets scored -6	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable fisheries is still a significant concern. Please see the associated matrix in Factor 5.1b. FIPs are not explicitly considered in the Source Fishery Sustainability Table, yet results from progress reports can be considered within the overall context of the fishery sustainability at the time of assessment. Seafood Watch will consider the explicit inclusion of FIP</p>



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		statuses for the next Standard Review period.
1	The sustainability in marine ingredients (i.e. source fishery/ies) should play a larger role in so that the weighting reflects appropriately across colour rankings (e.g. in the example provided a score of -10 should result in a red).	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable fisheries is still a significant concern. Please see the associated matrix in Factor 5.1b.</p>
1	“The present methodology for calculating FFER (based on the higher of the FM or FO score) is illogical in that it fails to accord any value to a reduction in usage of one marine-derived ingredient if the other functions as the determining factor. The original assumption behind this was that they are co-products, but in reality FM and FO each participate in independent markets and are driven by distinct formulation considerations. The current methodology has the unanticipated effect of potentially deterring a decision to reduce or substitute one ingredient if the other is the determining factor and fails	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. We did not adjust the</p>



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	<p>recognize that a real reduction in use of marine-derived ingredients has in fact occurred. A revised formula based on the 'weighted average' of FM + FO usage in proportion to the natural occurrence in the raw material from which they were derived would correct this problem. I can share an example formula, if requested.”</p>	<p>equations towards determining FFER to reflect these concerns, given the broader changes to the criterion that were made (inclusion of byproducts in this calculation, and modification of the scoring of Factor 5.1). While there are shortcomings to this equation, the incentive to reduce the determining ingredient which drives the FFER score remains. We will consider this adjustment to the FFER equation in future Standard changes.</p>
1	<p>Given the dire state of the ocean and a rapidly declining supply of fisheries and the criticality of forage fish for the ecosystem, it is our opinion that use of any marine ingredients from forage fish or krill should be considered unsustainable and be implemented as we suggest in F3's Response on MBAYAQ's Editable .pdf, page 51/52, Criterion 5, Question 1. In our opinion, the sustainability of sourcing should not outweigh the overall use of FM/FO, and that if waste by-products are used, the sustainability of those by-products should also be factored. Furthermore, because of the significant ecological and financial burden of feed in a fed aquaculture system, we propose that feed should be weighted more than an equal share as outlined in our responses to MBAYAQ's Table of Contents, page 4 overall comments on the 10 criteria.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that</p>



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		<p>low FFER from highly unsustainable fisheries is still a significant concern. This new scoring more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability. Please see the associated matrix in Factor 5.1b.</p> <p>Additionally, FMFO inclusions from by-product sources are now partially included in the FFER calculation, enabling an assessment of their sustainability.</p> <p>We did not shift the weighting of Criterion 5 in relation to the other criteria, as SFW considers all of these impacts equally (with the exception of the exceptional criteria).</p>
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1	<p>It's important to remember that the sustainability adjustment $[(FFER \text{ value} \times [2 \times \text{Sustainability score}]) / 10]$ is already based on the FFER such that the scoring deduction is higher if the FFER is higher for the same sustainability score.</p> <p>It is interesting to experiment with reversing or flipping the FFER and sustainability score in the current Wild Fish Use Score equation such that Wild Fish Use Score = $SS - [(SS \times [2 \times FFER \text{ value}]) / 10]$ where SS runs from 0 (unsustainable) to 10 (fully sustainable) - i.e. not the current negative scores. The final scores from the example provided then become 5.9 if the SS is 8 (i.e. equivalent to -2) or 0 if the SS is 0 (i.e. equivalent to -10),</p> <p>For the same example (20% fishmeal, FCR 1.5, FFER = 1.33) the values become:</p> <ul style="list-style-type: none">○ If SS = 10 (equivalent to zero in current table), score = 7.3○ If SS = 8 (equivalent to -2), score = 5.9○ If SS = 6 (-4), score = 4.4○ If SS = 4 (-6), score = 2.9○ If SS = 2 (-8), score = 1.5○ If SS = 0 (-10), score = 0 <p>fo, if FFER = 1:</p> <ul style="list-style-type: none">○ If SS = 10 (equivalent to 0), score = 8 (compared to current 7.5)○ If SS = 8 (-2) score = 6.4 (7.1)○ If SS = 6 (-4), score = 4.8 (6.7)	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable fisheries is still a significant concern. This new scoring more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability. Please see the associated matrix in Factor 5.1b.</p>
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	<ul style="list-style-type: none">○ If SS = 4 (-6), score = 3.2 (6.3)○ If SS = 2 (-8), score = 1.6 (5.9)○ If SS = 0 (-10), score = 0 (5.5) <p>So the score drops much more rapidly based on the SS instead of the FFER with heavy penalties for using unsustainable sources. Something to think about and play with in Excel, but important to keep in mind all the other complicated philosophical aspects in this factor.</p>	
1	<p>The aim of the Seafood Watch Standard is sustainability. Thus the sustainable sourcing should outweigh the overall use of fishmeal/oil to a certain extent. Inclusion of fishmeal is not necessarily a bad thing and needed for certain species on order to meet their demands. If sourced sustainably this should be acknowledged accordingly. At the same time, unsustainable sourcing even of only a small amount of fishmeal can still have a significant negative effect on the environment.</p>	<p>FINAL: Thank you for your comment. The Source Fishery Sustainability table has been adjusted to ensure it aligns with these principles. Additionally, there is now a decision rule related to this principle.</p> <p>Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable</p>



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		<p>fisheries is still a significant concern. This new scoring more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability. Please see the associated matrix in Factor 5.1b.</p>
1	<p>The sustainability aspiration and giving it a higher weight is exactly the right goal. However, not only MSC and other (partly criticized) certifications and the compliance with the MSY should be considered as sustainable but also additional sustainability metrics such as the above explained sea surface dependency, overfishing through fishing mortality and primary production of photosynthetic carbon required. Relating them to additional scores would automatically raise the weight of sustainability factors in the overall score of the feed criterion. Given the dire state of the ocean and a rapidly declining supply of fisheries and the criticality of forage fish for the ecosystem, it is our opinion that use of any marine ingredients from forage fish or krill should be considered unsustainable. The Standard should reward the use of the most sustainable fish oil and meal alternatives, e.g. algal oil, insect meals, crops and if not possible by-products. The very least acceptable ingredients should at least be (MSC or Monterey Bay) certified.</p>	<p>FINAL: Thank you for your comment. The Source Fishery Sustainability table has been adjusted to ensure it aligns with these principles. Additionally, there is now a decision rule related to this principle.</p> <p>The Seafood Watch Standard will evaluate the use of alternatives on a case-by-case basis utilizing the best available information surrounding these products. They will be assessed according to the same metrics as other traditional feed ingredients.</p>



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		<p>Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable fisheries is still a significant concern. This new scoring more heavily penalizes the use of FMFO in increasing quantities and/or decreasing sustainability. Please see the associated matrix in Factor 5.1b.</p> <p>These changes continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the impacts of the alternative ingredient.</p>
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1	<p>Criterion 5 Question 3 – Harvested byproducts utilization</p> <p><i>Should Seafood Watch reconsider how to value the further utilization of byproducts of the harvested farmed fish? Should all other uses, for further protein or otherwise, be considered an appropriate recapture of protein? Should non-protein-provision uses be weighted differently than protein provision uses?</i></p>	
PERIOD	COMMENT	RESPONSE
1	SeaChoice supports the current calculation based on protein production capture.	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>FINAL: Thank you for your comment! We have simplified this Factor to be a simple protein in – protein out equation, thereby avoiding the need to determine both the edible nature of ingredients applied, as well as the fate of processing byproducts downstream.</p>
1	Yes, this would be desirable in encouraging full utilization for both food and non-food usages since non-food usage create offsets for other ingredients which also have an ecological footprint.	PC1: We will consider this in reviewing the scoring for this criterion.



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		FINAL: Thank you for your comment! We have simplified this Factor to be a simple protein in – protein out equation, thereby avoiding the need to determine both the edible nature of ingredients applied, as well as the fate of processing byproducts downstream.
1	This factor is (largely by necessity) an approximation. I think it's okay to include all other uses of byproducts (as long as it doesn't go to landfill). Trying to separate out other uses and byproduct types is an unnecessary complication which won't make much change to the scores and for which it will be hard to get data in most circumstances.	PC1: We will consider this in reviewing the scoring for this criterion. FINAL: Thank you for your comment! We have simplified this Factor to be a simple protein in – protein out equation, thereby avoiding the need to determine both the edible nature of ingredients applied, as well as the fate of processing byproducts downstream.
1	product (BP) use is currently being considered equal as the Edible Yield (EY) in the “protein utilized” equation: % Protein Utilized = % Edible Yield + By-products Utilized.	FINAL: Thank you for your comments.



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With an estimated one-third of all food produced for human consumption being lost or wasted (Gustavsson et al. 2011), calls to limit waste and recover edible food are growing. The United Nations (UN) Sustainable Development Goals (SDGs) call for a reduction in food loss during production, and throughout the supply chain, through to consumption (UNDP, 2017). In the context of aquaculture, recent studies estimate that there is substantial potential to increase the sustainability of the industry through maximizing human edible yield by strategically managing BPs (Jackson and Newton, 2016) (Stevens et al. 2018).

1. By-product use should be directed stronger towards direct human consumption:

Stevens et al. (2018) state, that better use of BPs through trade with low income food deficient countries may have implications for food insecure areas of the world. Right now, in the Scottish aquaculture industry the majority of salmon BPs used for human consumption were transported to foreign countries, where they were either used directly for food production (fish head soup, barbequed belly flaps) or further processed for the food service or retail industries (surimi, pâtés, mousses, or for other value-added products). In some markets, canned salmon fins are considered a delicacy, and in both Japan and Taiwan the belly flaps of salmon are a popular foodstuff which can be barbequed or fried. On occasion, the price for BPs in these regions has been comparable to the fillet price (Batista, 2007). Additionally, there is clearly room for consumers to be encouraged to use more fish BPs in their cooking. (Stevens et al. 2018)

Byproducts are now partially included in the calculation for FFER and fully included in the calculation for net protein gain or loss. Seafood Watch has decided against further delineating each type of byproduct use for the sake of complexity. Nutrient recapture (beyond protein) is indeed a topic that is important for any discussion around sustainability of farmed fish, however Seafood Watch has decided against including it in further detail at this time.



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2. By-product utilization for non-food products should not be considered an appropriate recapture of protein:

Fish is a key source of various nutrients to the global population (Henchion et al. 2017). To avoid ethical discussions (like Bio Fuels vs. Food Agriculture) by-product utilization for non-food products should not be considered an appropriate recapture of protein and consequently valued distinctly lower. As a hypothetical example: Processor A and B produce 75% EY. If the remaining 25% (the by-product) from Processor A went to anaerobic digestion for fuel production, this outcome is less desirable than Processor B directing his by-products to specialized aquaculture and livestock feeds. As such, an "EY + by-product" sum alone is not an adequate indicator of best practice for by-product utilization. Accordingly, the by-product valuation should give an incentive to maximize the proportion of Edible Yield.

Summarizing Point 1 and 2, we recommend valuing and weighting the by-product use of aquaculture fish according to the Food recovery hierarchy for fish by-products as presented by Stevens et al. (2018): From "BP Use for direct Human Consumption" as the best option (equally valued as EY), "Process by-products for human use", "Feed Animals", "Industrial Uses", to "Composting" as the worst option. Also, a minimum required baseline of by-product utilization could be implemented.

3. Moving from Protein recapture to Nutrient Recapture:

Fish is not only a source of animal protein but also of fatty acids, vitamins and other essential nutrients (Beveridge et al. 2013; Kawarazuka and Béné 2011; WOR2 2013). But currently levels of EPA and DHA have been falling in farmed salmon (Jackson and Newton,



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	<p>2016). In the context of by-product use, we recommend monitoring and valuating the recapturing of key nutrition's of aquaculture products (besides Protein) such as EPA and DHA.</p>	
<p>2</p>	<p>Criterion 5 Request for comment – Replacing the Wild Fish Use scoring equation</p> <p>1. Do you agree with this approach?</p> <p>2. Is the increased penalty for less sustainable source fisheries justified, even at low FFER values?</p> <p>3. How could this approach be improved?</p>	
<p>PERIOD</p>	<p>COMMENT</p>	<p>RESPONSE</p>
<p>2</p>	<p>1. Yes, I agree with this approach. However, considering the increasing interest in ecological measures of forage fish sustainability, rather than economic sustainability, perhaps triple weighting of use of wild fish should be considered. Conserving a larger proportion of forage fishes for other marine predators is where the professional fisheries managers are heading and MBA Seafood Watch should be in-step with the leading scientists.</p> <p>2. Yes, the increased penalty will be an incentive for the feed companies to more quickly adopt sustainable alternatives.</p>	<p>FINAL: Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable fisheries is still a significant concern. This new scoring more heavily penalizes the use of FMFO in increasing quantities and/or</p>



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	<p>3. Consider a bonus system for companies completely replacing wild caught fish with sustainable alternatives.</p>	<p>decreasing sustainability. Please see the associated matrix in Factor 5.1b.</p> <p>These changes continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the impacts of the alternative ingredient.</p>
2	<p>1. I agree with the overall approach but a new study using the Millennium Ecosystems Assessment framework finds that regardless of the source fishery, adopting the Millennium Ecosystem Assessment framework, forage fish are over three times of their direct catch value given the other species supported, including the economic value of seabirds, marine mammals and other commercial fisheries such as tuna, cod and salmon. See Ling Cao, "Illustrating the hidden economic, social and ecological values of global forage fish resource".</p> <p>2. Yes, the increased penalty is justified and could be even greater.</p>	<p>FINAL: Thank you for your comment. We have shifted the scoring of this Factor to utilize a matrix, as opposed to an equation. The combination of FFER and source fishery sustainability table results in a final score as determined by this matrix, driven by the notion that low FFER from highly unsustainable fisheries is still a significant concern. This new scoring more heavily penalizes the use of FMFO in increasing quantities and/or</p>



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		<p>decreasing sustainability. Please see the associated matrix in Factor 5.1b.</p> <p>These changes continue to incentivize the reduction of FMFO, while the new Factor 5.3 incentivizes the use of low carbon ingredients, as opposed to indiscriminate replacement of FMFO without consideration of the impacts of the alternative ingredient.</p>
2	<p>1. Yes, the approach is agreed upon, as it promotes sustainable fisheries and at the same time the reduction of wild fish use in fish feed.</p> <p>2. Yes, there should be a high incentive for fisheries to improve the quality and sustainability of their catch, even for low inclusion of the fish meal and fish oil in fish feed.</p> <p>3. The approach might be improved by differentiating fish meal and fish oil from wild catch and from trimmings (i.e. by products of edible fish)</p>	<p>FINAL: Thank you for your comment and support of our changes. Fish meal and oil from wild catch are differentiated from those from trimmings through the use of an adjustment factor of 0.05 to by-product inclusions.</p>
1	<p>SeaChoice supports this approach and believes the increased penalty is justified.</p>	<p>FINAL: Thank you for your comment and support of our changes.</p>
1	<p>We do not support the general statement that aquaculture operations that do not provide external feed (i.e. bivalves, extensive) should simply receive a 10 out of 10 score for this</p>	<p>FINAL: Thank you for your comment and support of our</p>



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	<p>criterion. The score simply should be "not applicable". The reality is that extensive production systems still use resources to grow their product, but they come by that passively. As such, many of the issues in this criterion are not applicable, but there is still an ecological footprint to growing those species</p> <p>We support the greater influence of the sustainability score. However, there should be acknowledgment of where improvements are being made to source fisheries via FIPs in the Fishery Sustainability examples (see follow on note in relevant box).</p>	<p>changes. Yes, extensive production systems still use resources to grow their product, but they do not use feed, which is the subject of this criterion. The ecological impacts of other resources that may be used by extensive or semi-intensive farms (e.g. fertilizer, probiotics, etc.) are captured in different criteria.</p> <p>FIPs are not explicitly considered in the Source Fishery Sustainability Table, yet results from progress reports can be considered within the overall context of the fishery sustainability at the time of assessment. Seafood Watch will consider the explicit inclusion of FIP statuses for the next Standard Review period.</p>
2	<p>Yes, we agree with this approach.</p> <p>We think the penalties are justified.</p>	<p>FINAL: Thank you for your comment and support of our changes.</p>



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	<p>“...an associated spread of scores from 0 to 3.3 as a low concern, 3.4 to 6.6 as medium concern and 6.7 to 10 as low concern.”</p> <p>Typos above</p> <p>1.- Agree with these approach.</p>	<p>FINAL: Thank you for your comment and support of our changes; we have adjusted the text.</p>
2	<p>Criterion 5 Request for Comment - Removing by-product ingredients from the FFER scoring</p> <p>Other schemes continue to ignore the use of by-product ingredients in feed calculations, and the use of by-product ingredients to grown farmed fish is currently logical to society; however, it ignores the true ecological cost of these ingredients. We welcome comments on this approach.</p>	
PERIOD	COMMENT	RESPONSE
2	<p>The use of by-products in feeds is likely to shrink rather than increase as more and more by-products are turned into food stuffs for direct human consumption (fish sticks, fish balls, fish sauce, paste, etc.) Odds are that the impacts of the calculations will be minimal in the near future.</p>	<p>FINAL: Thank you for your comment and support of our changes. We are applying a nominal adjustment factor of 0.05 to by-product fish meal and oil ingredients, aligned with the economic allocation for feed</p>



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		ingredient impacts used in Factor 5.3.
2	<p>There is a need to differentiate the production of fish meal and fish oil from entire wild fish and the production of fish meal and fish oil from trimmings of wild fish or farmed fish. The latter ones participate to the circular economy and their environmental impact is considered within the feed LCA based economic allocation. Their impact on wild population for the wild fish limited, due to the intended use of those fish for human consumption. The FFER should therefore distinguish the two type of products.</p>	<p>FINAL: Fish meal and oil from wild catch are differentiated from those from trimmings through the use of an adjustment factor of 0.05 to by-product inclusions. This is in-line with LCA-based economic allocation, which is utilized in data informing calculations in Factor 5.3.</p>
2	<p>SeaChoice agrees that the current calculation ignores the true ecological cost of these ingredients. In addition, the definition of 'byproduct' varies greatly (e.g. wild herring discarded from roe fisheries vs. processing waste trimmings) - some are clearly more justified to be called a 'byproduct' from a sustainability perspective than others. We support the shift to including the true ecological cost of byproducts. However, we do not want to the incentive to utilize byproducts lost either. Is there a potential to capture the true cost and than apply a nominal adjustment score in order to acknowledge that byproducts use is preferred over waste discarding?</p>	<p>FINAL: Thank you for your comment and support of our changes. We are applying a nominal adjustment factor of 0.05 to by-product fish meal and oil ingredients, aligned with the economic allocation for feed ingredient impacts used in Factor 5.3.</p>
2	<p>Even this is a very interesting subjetc, it has been widely discussed.</p> <p>We consider that it can not be included because it is a way to increase feed efficiency in terms of use of wild catches.</p> <p>Otherwise will be a higher pressure on wild fisheries to include fish meal and oil from those sources and will be an incentive to reduce the by products inclusion.</p>	<p>FINAL: Thank you for your comment. By applying a nominal adjustment factor of 0.05 to by-product fish meal and oil ingredients, the incentive towards the use of by-products over wild fish</p>



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		(assuming sustainability of sources is equal) is maintained, while capturing some of the ecological cost of their production.
2	<p>Criterion 5 Request for Comment – Adjustments to Source Fishery Sustainability scoring table: MSC placement</p> <p>In the Source Fishery Sustainability table below, minor adjustments have been made, particularly to scores for MSC-certified fisheries. Previously, the number of conditions in some certified fisheries had been a concern that warranted separation into “no conditions”, “minor conditions”, and “major conditions”, but this is no longer justified due to the complexities of the condition process within the MSC certification scheme. MSC-certified fisheries are reduced in score slightly and separated simply by “with” or “without” conditions.</p> <p>Please provide comment on:</p> <ol style="list-style-type: none"> 1. These adjustments, as well as on all scoring categories in this table. 	
PERIOD	COMMENT	RESPONSE
2	There seems to be a recent spate of complaints about the veracity of MSC certifications that could affect forage fish species. This should be considered before linking too closely.	FINAL: Thank you for your comment. Our change here seeks to address these concerns, while still recognizing that MSC certification has been benchmarked to at least a



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		Seafood Watch Yellow. Further, the presence of an MSC certification would be used in conjunction with other information regarding sustainability of the source fishery (e.g. FishSource scores).
2	The issue is that feed companies are constantly shifting formulations based on ingredient prices. It is difficult to quantitatively rate sustainability of feed, unless a company discloses the total tonnage of fm and fo used. The F3 Team thinks this requires further thought and discussion on how to rate the sustainability of feed, and consequently the sustainability of the aquacultured seafood. One approach may be that if NO fishmeal or fish oil is used, that they get a triple bonus. If company uses no FM but fish oil (FO), they get a double bonus.	FINAL: Thank you for your comment. Seafood Watch has developed relationships with many feed companies which has enabled the provision of high quality, accurate data to inform these assessments. We believe that the structure of the Source Fishery Sustainability scoring table and the Criteria at large effectively incentivizes the reduction of unsustainable fish meal and oil sources in feed.
2	The proposed approach is acceptable	FINAL: Thank you for your comment and support of our changes.
2	SeaChoice supports these changes.	FINAL: Thank you for your comment and support of our changes.



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2	<p>We suggest that source fisheries that are demonstrating progress on improvements projects be included in the sustainability table as follows:</p> <p>FIP with progress rating D-E gets scored =2</p> <p>FIP with progress rating A-C gets scored =4</p>	<p>Thank you for your comment. FIPs are not explicitly considered in the Source Fishery Sustainability Table, yet results from progress reports can be considered within the overall context of the fishery sustainability at the time of assessment. Seafood Watch will consider the explicit inclusion of FIP statuses for the next Standard Review period.</p>
2	<p>Criterion 5 Request for Comment – Adjustments to Source Fishery Sustainability scoring table</p> <p>Note: The previous scoring equation has been removed, and these are the proposed new scoring tables, including numerical scores (but without the red/yellow/green highlights), as discussed at the beginning of this criterion.</p> <p>Please provide comment on:</p> <ol style="list-style-type: none"> 1. These adjustments, as well as on all scoring categories in this table. 	
PERIOD	COMMENT	RESPONSE
2	<p>Some encouragement to completely or near complete replacement of fishmeal and fish oil would provide more incentive to reduce FM FO usage. Some kind of bonus points or score should be considered.</p>	<p>FINAL: Thank you for your comment. We believe that the structure of the Source Fishery</p>



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		Sustainability scoring table and the Criteria at large effectively incentivizes the reduction of unsustainable fish meal and oil sources in feed.
2	We want to encourage companies to source fishmeal and fish oil from sustainable sources. The current practice of scraping whatever is in the ocean, and throwing it into pellets -- use of trash fish -- is pretty awful. Just look at globalreportingprogram/fishmeal	FINAL: Thank you for your comment. We believe that the structure of the Source Fishery Sustainability scoring table and the Criteria at large effectively incentivizes the reduction of unsustainable fish meal and oil sources in feed.
2	The numerical and colored approaches should be maintained, as the color coding is easier to read, but is dependent on the numbering.	FINAL: Thank you for your comment. The numerical approach will be maintained, but the coloration was only to illustrate the changes during the Review period. Leaving color in the matrix would be misleading, as a poor 5.1 score ("Red") does not necessitate a "Red" Criterion 5 score.
2	SeaChoice supports these changes.	FINAL: Thank you for your comment and support of our changes.



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2	<p>- A score of 10 for non-fed aquaculture seems misleading -- suggest this be n/a instead.</p> <p>- Consider revisiting the section of SS=10, and FFER is <1.0 -- there is a clear argument that this could be scored 10 across that whole line (upper left corner of the first table). The system is using a fully sustainable feed source at a highly efficient conversion ratio.</p> <p>- The section where SS=2 and FFER is between 1.1-1.4 should be scored as zero. The system is using an unsustainable source of feed in in an inefficient way.</p>	<p>Thank you for your comment.</p> <p>Non-fed aquaculture will remain scored as 10 out of 10, given that these operations are net producers of protein and should be recognized as such.</p> <p>As a marine conservation organization, the Monterey Bay Aquarium maintains that wild fish inclusions should be minimized, regardless of the sustainability of the source, given the variety of ecosystem services provided by these fish in the wild. Thus, a score of 10 out of 10 is given to those systems using no fishmeal or fish oil.</p> <p>We have adjusted the source fishery sustainability table to better reflect these concerns while maintaining</p>
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		the application of the precautionary principle.
2	<p>Criterion 5 Request for Comment – Edits to 5.2</p> <p>As the edits to the Background and Rationale section at the start of this criterion show, Seafood Watch is proposing for discussion to consider all protein ingredients equivalent, regardless of other commercial or perceived societal designations as “by-products” or “non-edible”.</p> <p>Please provide comment on:</p> <p>1. We welcome comments on this approach.</p>	
PERIOD	COMMENT	RESPONSE
2	<p>We can not see that this standard requirement makes sense. To our knowledge no animal production system can be a net protein producer. The protein content of most fish species are in the range 18-20%. This protein level is genetically determined. Fish can not synthesize protein, but they can build their body protein from the protein (amino acids) supplied in the feed. All fish will then have an optimum (digestible) protein content in the feed that will give the best growth and lowest FCR. For fish species the optimum protein content will be in the range of 40-60% dependent upon species and life cycle. As the indicator is constructed it means that all aquaculture systems most likely would score between 3 and 4.</p>	<p>FINAL: While it is true that consumption always results in a net loss of energy and other constituents, the intent of the Criterion 5 is to assess the efficiency and sustainability of active feed provision – that is, unfed systems are considered to have zero protein input and therefore have a ‘protein positive’ result. We do agree that</p>



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	<p>Within nutrition there is no term named net protein gain or loss. What is sometimes referred to is Protein Efficiency Ratio (PER) which in principle is the same as you have described, only that biological FCR in most cases would be used. One then just looks at the ratio of protein retained in the fish. One would like this number to be as high as possible. Within biological limits it will vary between 40 and 60%. A high number indicate sthat you have formulated the diet with the right protein content and quality.</p>	<p>feed manufacturers and producers work to attain a best retention of protein and other nutrients, and doing so results in a more positive score than less efficient feeding regimes.</p>
2	<p>This approach is the best one. However, instead of looking at protein content, it would be better to speak about nitrogen content (difference is a factor of 6.25), to be comparable with aspects in comparable domain such as LEAP. The nitrogen balance between the nitrogen intake and the nitrogen output should be done on a production cycle or on a yearly basis. The equations could be simplified in line with the LEAP guidelines:</p> <p>N Intake = \sum (% protein in feed / 6.25) x feed consumption on the farm (considering the different feed types used on the farm)</p> <p>N Fish = % protein in fish / 6.25 x quantity of fish produced on the farm</p> <p>N gain/loss = N Fish – N Intake</p> <p>N gain/loss per ton of fish = N gain/loss / quantity of fish produced on the farm</p>	<p>FINAL: We currently have an accounting of nitrogen retention, through the lens of potential for nutrient-related impact to a receiving waterbody, in Criterion 2 – Effluent.</p> <p>Reframing the unit of measurement from a per-fish percentage basis (effectively a per-unit of production basis) to either a cycle or annual basis is an interesting and worthy concept to consider. However, given industry’s high distribution of farm sizes and therefore per-cycle or per-annum production, it would seem challenging to identify what “farm” to use (as representative for</p>



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		<p>all) for data such as feed consumption and quantity produced. If considering “the farm” to be all farms in the industry under assessment, we maintain that nitrogen-specific accounting is done in Criterion 2 and the nitrogen embodied in protein will be accounted for in Criterion 5.</p>
2	<p>Similar to our earlier comments regarding fish byproducts, we agree with the approach to include the ecological cost of these byproducts into the calculation - however, we would like the SFW calculation to still provide some incentive for byproduct utilization. Perhaps through some sort of nominal adjustment?</p>	<p>FINAL: Our recognition of the natural resource efficiency gains resulting from utilization of fisheries and aquaculture byproduct ingredients will continue to reside in Factor 5.1. However, those byproduct ingredients do still represent protein input into aquaculture systems, and we feel confident that their full inclusion in the calculation results in a more comprehensive and accurate accounting of a farmed system’s protein budget.</p>



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2	Agree with the proposed new approach. This section of C5 used to be very complex and lead to analyst bias or subjectivity to complete the assessment, which should greatly reduced in this new proposed approach.	Thank you for the positive feedback.
2	Criterion 5 Request for Comment – New approach to 5.3 Please provide comment on: 1. Do you agree with this approach? 2. How could this approach be improved?	
PERIOD	COMMENT	RESPONSE
2	1. Approach is ok, especially if innovative ingredients are noted to have minimal carbon intensity, especially algal and insect products and single cell organisms and can also fix CO and CO2. 2. Approach could recognize the carbon benefits of alternative ingredients.	1. The production and use of innovative ingredients does still create global warming potential (GWP), and the revision of this Factor is designed to account for the GWP of all feed ingredients. Where innovative feed ingredients have low GWP, their use will indeed positively impact the score as compared to ingredients with higher GWP.



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		2. Where innovative feed ingredients have low GWP, their use will indeed positively impact the score as compared to ingredients with higher GWP.
2	The LCA approach is recommended, as this considers the Global Warming Potential (GWP), including Land Use Change (LUC), as well as the Eutrophication Potential (EP) and the Acidification Potential (AP), i.e. a holistic approach of the environmental footprint of feed. Hence, we support we use of LCA for the evaluation of the environmental footprint of feed, to be considered in combination with the FFER to evaluate the feed impact.	FINAL: The GFLI database does include the metrics noted, and we have selected Global Warming Potential (GWP) inclusive of Land Use Change (LUC). The use of metrics such as Eutrophication Potential are highly context-specific, but the use of GWP (inclusive of LUC) is more universal.
2	SeaChoice supports this approach.	FINAL: Thank you for the positive feedback.
2	<p>Although we agree in principle accounting for carbon emissions is a very important part of the discussion given the state of the climate crisis, we don't agree with including it exclusively here as part of the feed score.</p> <p>In this iteration of the criteria, SFW has moved away entirely from trying to assess Energy Use. So this begs the question of why is it being maintained in the feed criterion, but GHG emissions from other industry practices are not being accounted for? If there is clear evidence that feed is commonly the biggest source of GHG emissions in aquaculture</p>	FINAL: There is indeed clear evidence that the carbon intensity embodied in feed use is typically the largest share of an aquaculture industry's carbon footprint (or overall GHG emissions). There are, of course, exceptions, but these are highly context-specific and the data are often poor. Feed-related



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	<p>operations, then there may be some rationale for keeping this approach. If not, we suggest that it adds substantial complexity for limited gain.</p> <p>We would continue to encourage SFW to consider how to build a more robust accounting of GHG emissions of aquaculture industries.</p>	<p>carbon intensity is currently the most robust inclusion of an aquaculture industry's greenhouse gas footprint.</p> <p>The largest component of the global warming potential (GWP) of a fed aquaculture product is often embedded in feed resources, though this depends on the production system and species. The embedded footprint in feed is by far the most studied, and as such, is the most data rich. Seafood Watch will consider the inclusion of on-farm emissions footprints for future Standard Reviews, and this consideration is particularly reliant on data availability and quality, in order to be able to make accurate and reliable estimates.</p>
2	We agree with the approach.	Thank you for the positive feedback



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2	<p>1.-Not entirely, since there is not enough information to establish the impact of crops on global warming. In this regard, the use of raw materials from cattle that incorporate greenhouse gases could also be considered. It seems that, under the focus of the standard, one should consider whether the crops used affect the functionality of ecosystems that directly or indirectly affect the oceans. It is possible to identify those areas that play a fundamental role in the functionality of the ocean. for example certain rivers or coastal spaces.</p> <p>2.- The global warming equation must also be netted concerning those aquaculture that fix carbon or use technology that reduce or compensate for carbon</p>	<p>1. The content of this comment seems to contradict itself. However, the GFLI database is the most comprehensive and consistent accounting of the LCA impact categories of feed input ingredients known to us, inclusive of global warming potential (both with and without land use change) eutrophication, ecotoxicity, ozone formation, and others. Further, the database acknowledges how those impacts differ between production origins and processing methods, so the “identifying areas that play a fundamental role in the functionality of the ocean” is embodied in the estimates provided for each data point.</p> <p>Also of note – accounting for the raw materials from cattle that are suggested to be considered must be inclusive of an account of the crop ingredients they are fed, so the suggestion to include animal</p>
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		<p>products but not crop ingredients is incomplete.</p> <p>2. We appreciate the notion that carbon-fixing production systems should be recognized for doing so. However, the current scope of Factor 5.3 is limited to that which is embodied in the feed applied to produce one kg of farmed seafood protein. Other sources of carbon consumption, such as from energy use on farm, are not currently accounted for, and similarly, carbon sequestration is currently outside the scope of this criterion. We will continue to evaluate the potential to include more comprehensive carbon accounting in future iterations of the Standard.</p>
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<p>2</p>	<p>1) I think that including an estimate of the GWP of cultured seafood production is long over due in the SFW (and other sustainable seafood recommendation and certification) process.</p> <p>Furthermore, basing it at first instance on feed-related GHG emissions is a good and defensible place to start. However it does leave out sources of emissions that can be substantial and in some instances can exceed feed-related emissions. This will pose logical inconsistency challenges that some will raise pretty quickly so you'll need to a) be either prepared with good arguments why non-feed related GHG emissions don't count or count as much or b) have a plan in place to in the not too distant future incorporate non-feed related GHG emissions</p> <p>To be clear, I'm not advocating for detailed life cycle like analyses with the above observation. Indeed the scale at which SFW undertakes analyses and provides recommendations is such that you will always have to rely on robust but somewhat crude first approximations of GHG emissions but restricting the quantification to only feed-related emissions is leaving a potentially big hole in some of your assessments on this measure.</p> <p>2) First, descriptively, I'd suggest avoiding the common though imprecise descriptors like carbon emissions or carbon footprint in favour of describing the thing that you are attempting to quantify more precisely as for example greenhouse gas emissions (one reason for this is that while many GHGs are C based (e.g. CO₂, CH₄) others are not (e.g. N₂O))</p> <p>Similarly, should the basis of analysis be per ton of live weight of farmed seafood produced rather than per ton of farmed fish produced (there are many cultured and fed species that are not fish)</p>	<p>1. Thank you. We acknowledge the instances where non-feed-related GHG emissions exceed those related to feed use, and limiting the scope to feed use is ultimately an incomplete accounting of an aquaculture industry's GHG emissions. However, we do feel confident that our selection to scope global warming potential at feed use and rely on the GFLI database for the data to do so is the most robust, data-driven, and universally-applicable methodology available, though we will also continue to evaluate the inclusion of additional sources of emissions in future iterations of the Standard as data availability and quality increase.</p> <p>2. Thank you for the suggestion to more precisely describe our metric; we are now using the accurate descriptor of "global warming potential (inclusive of land use</p>
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	<p>Second, look v seriously at extending the scope of GHG emissions to be included to those that arise at the farm site through direct energy use. This would address a potentially large hole that you could be introducing by overlooking some potentially large non-feed related emission sources that can arise in some culture systems</p>	<p>change”. Regarding the terminology of “seafood” versus “fish”, we do acknowledge at the beginning of the Standard document that we use “fish” throughout the document but intend the term to be inclusive of all finfish, shellfish, etc. Finally, as noted above, we do acknowledge that non-feed-related emission sources are important and will continue to evaluate their accounting in future iterations of the Standard.</p>
<p>2</p>	<p>Criterion 5 Request for Comment – Use of GFLI database</p> <p>Please provide comment on:</p> <ol style="list-style-type: none"> 1. How should we assess global warming potential if feed composition or inclusion level of an ingredient is unknown? 2. How should we assess global warming potential if an ingredient is not found within the GFLI database? 	
<p>PERIOD</p>	<p>COMMENT</p>	<p>RESPONSE</p>



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2	<p>1 and 2. The closest equivalent ingredient present in the database should be selected and used as a proximate value. In most developing countries the available ingredients tend to be agricultural waste products with little alternative market value and minimal global warming potential.</p>	<p>FINAL: If any crop, animal, and/or alternative ingredient is not found in the GFLI database, the assessment will use the aggregated value(s) for these categories (e.g. "Total vegetable meals") in the database. If there is no appropriate category, the ingredient will not be included in the calculation.</p> <p>If any crop, animal, and/or alternative ingredient is found in the GFLI database, but the origin is not known or not found in the database, the assessment will use an average value between the listed "GLO" value and the worst value for that ingredient.</p> <p>Feed formulations whose ingredients do not sum to 100% will be bootstrapped to 100% to avoid an under-accounting of the global</p>
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		warming potential of an industry's feed use.
2	The evaluation of the environmental footprint of a feed should better be done by feed miller, that can provide the information, in a consolidated way (i.e. considering batch delivered and different types of feed) to the farmer. The feed producer should better use either primary data (i.e. from its suppliers) or secondary data (i.e. from GFLI). In the case of use of secondary, the use of an ingredient not described in the GFLI database could be done on the basis of proxies (i.e. similar product / process in the database).	FINAL: To avoid inconsistent feed footprint accounting methodologies – as would be experienced by obtaining data from myriad feed manufacturers – the GFLI database (which requires methodological alignment for all data points) will be used as the basis for ingredients' global warming potential, and the calculations of a feed's GWP will be done by Seafood Watch. Regarding ingredients whose data are incomplete in the GFLI database: Any crop, animal, and/or alternative ingredient is not found in the GFLI database, the assessment will use the aggregated value(s) for these categories (e.g. "Total vegetable meals") in the database. If there is no appropriate category, the ingredient will not be included in the calculation. If any crop, animal, and/or alternative ingredient is found in the GFLI database, but the



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		<p>origin is not known or not found in the database, the assessment will use an average value between the listed “GLO” value and the worst value for that ingredient. Feed formulations whose ingredients do not sum to 100% will be bootstrapped to 100% to avoid an under-accounting of the global warming potential of an industry’s feed use.</p>
2	<p>1. Yes, for consistency between reports, all assessments should include a global warming potential - whether or not it is known.</p> <p>2. Refer to Life-cycle Analysis studies for the product if available. If not, include an 'unknown' score that is precautionary.</p>	<p>1. Thank you. All assessments will have a Factor 5.3 score.</p> <p>2. If any crop, animal, and/or alternative ingredient is not found in the GFLI database, the assessment will use the aggregated value(s) for these categories (e.g. “Total vegetable meals”) in the database. If there is no appropriate category, the ingredient will not be included in the calculation.</p>



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		<p>If any crop, animal, and/or alternative ingredient is found in the GFLI database, but the origin is not known or not found in the database, the assessment will use an average value between the listed “GLO” value and the worst value for that ingredient.</p> <p>Feed formulations whose ingredients do not sum to 100% will be bootstrapped to 100% to avoid an under-accounting of the global warming potential of an industry’s feed use.</p>
2	We do not have information and experience to add comments.	N/A
2	Industry need to provide evidence of Carbon footprint of raw material.	FINAL: To avoid inconsistent feed footprint accounting methodologies – as would be experienced by obtaining data from industry – the GFLI database will be used as the basis for ingredients’ global warming potential, and the



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		calculations of a feed's GWP will be done by Seafood Watch.
2	<p>1)The problem of source of data and resolution is always going to be a problem. I've not looked at the level of specificity in the GFLI database but there can be substantial differences in the GHG emissions that result from say producing wheat in one setting compared to another setting (see for example the range of GHG emisiosn intensities reported in Fig 1 in the paper by Poore and Nemecek published in 2018 in Science)My point is that you're always going to be approximating the GHG emissions of many feed inputs so a further level of approximation isn't unreasonable. Approaches could include taking average values from across the related suite of ingredient (say all fishmeals for which emisiosn data are available) and using this to represent the specific source of fishmeal which is being included but for which a specific value is not available.</p> <p>Speaking of fishmeals and oils, if GFLI database is thin on numbers for these inputs, see Cashion, T., P. Tyedmers & R. Parker (2017) Global reduction fisheries and their products in the context of sustainable limits. Fish and Fisheries. 18(6):1026-1037 where we report GHG emissions for a wide sutie of fishmeals and oils up to the reduction plan gate.</p> <p>2) you could mine the literature BUT when drawing data from the literature you need to be alert to potential differences in methods used in different studies etc. Hmmm, perhaps a better first place to look for a decent representative number is in a pre-existing compilation of LCA-based GHG emission estimates. The best current version of this would be the paper by Poore and Nemecek from 2018 in Science. Though they are only reporting ranges, means and median emisison intensity values for whole crop and other product sectors, not the details of say Polish or Australian wheat production</p>	<p>1. We agree that data availability and resolution will always be imperfect. However, GFLI data do include production origin for all ingredients in the database. If any crop, animal, and/or alternative ingredient is not found in the GFLI database, the assessment will use the aggregated value(s) for these categories (e.g. "Total vegetable meals") in the database. If there is no appropriate category, the ingredient will not be included in the calculation. If any crop, animal, and/or alternative ingredient is found in the GFLI database, but the origin is not known or not found in the database, the assessment will use an average value between the listed "GLO" value and the worst value for that ingredient. Feed formulations whose ingredients do not sum to 100% will be bootstrapped to 100% to avoid an</p>



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		<p>under-accounting of the global warming potential of an industry's feed use.</p> <p>2. To avoid inconsistent feed footprint accounting methodologies – as likely would be experienced by obtaining data from literature – the GFLI database (which requires methodological alignment for all data points) will be used as the basis for ingredients' global warming potential, and the calculations of a feed's GWP will be done by Seafood Watch.</p>
2	<p>Criterion 5 Request for Comment – Scoring of feed global warming potential</p> <p>As evident in the table above, we are seeking comment regarding the scoring of total feed global warming potential per ton of farmed fish.</p> <p>Please provide comment on:</p> <p>1. What constitutes low feed global warming potential (in terms of tons CO₂ eq), and what constitutes very high global warming potential?</p>	
PERIOD	COMMENT	RESPONSE



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2	We do not have information and experience to add comments.	N/A
2	Not enough information to asses global warming feed impact (not yet). Please check all feed able sources, could not or a minimal source of green feed for all aquaculture productions. Since FAO declare a Aquaculture as a good protein alternative to ensure a minimal carbon footprint.	FINAL: We are confident that the use of the GFLI database and the methodology we've laid out allows for the most consistent and robust accounting of an aquaculture industry's feed-related global warming potential. We look forward to more and better data as research continues.
2	Fundamentally, there is no absolute or objective basis upon which a score or rating of low, medium or high can be assigned. This is something that I've discussed with Lisa Max and others at SFW in this regard in the past. The approach that we took with the seafood CO2 web tool/reporting platform was to benchmark seafood GHG emissions against the other major competing center of plate animal protein sources (Chicken beef and pork). The good news is that the average emission intensities of these livestock sources of animal protein are markedly different and can be used to anchor parts of your ten point scale. For example you could take the mean GHG emission intensity of chicken from Poore and Nemecek 2018 and use this as the anchor for say "7" on your ten point scale. then use the mean value of beef in Poore and Nemecek 2018 (use the value from beef from dedicated beef producoitn and not from dairy herds) as say your anchor for "3" and then scale all values above, below and between these to the rest of your ten point. Of course what this is fundamentally saying is that low feed source emitting farmed seafood is only good if its better than chicken etc. But I simply can't think of a way to scale low, medium and high other than by using the main alternatives.	FINAL: Thank you for your comment. Indeed, we have consulted with the literature and determined the scoring bands based on the values found. We did not benchmark against other animal protein sources, as it would be inconsistent with scoring determinations for other Criteria (e.g. Effluent is not scored based on nutrient discharge intensities of other proteins). Our scoring aligns with values found in Poore and Nemecek (2018) for farmed fish and crustaceans, and was informed by literature compiled by the Seafood



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		Carbon Emissions Tool. We look forward to more and better data as research continues, and will update this scoring as necessary in future Standard Reviews.
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CRITERION 6: ESCAPES		
1 GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
1	<p>There should be a list for the recapture adjustment (e.g. 100 % = 10, 90 % = 9...)</p> <p>This immediately puts open systems at the either High or Moderate- High end of the score, while escapes might not be a problem/not applicable at all</p>	<p>The recapture adjustment can be more clearly laid out in the standard and we can work to incorporate that clarification. The recapture adjustment does not apply in all cases; only where there's enough evidence to show that recaptures happen and that they're effective. It is an overall boost to the escape risk score.</p> <p>FINAL: Recapture adjustment score is more clearly defined, along with a numerical example of how to interpret the clarification (see Factor 6.1). As a result, open systems are considered a Moderate risk system</p>



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		and any evidence of recapture methods and success can improve the score of Factor 6.1 with an appropriately quantified recapture adjustment.
1	same as chemicals, preventive measures should be key factors of evaluation.	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>PC2: Preventative measures are included in the scoring factors, primarily in Factor 6.1-escape risk.</p> <p>FINAL: Factor 6.1 assesses the escape risk of a production system, and any preventative measures that a system implements is considered and scored appropriately.</p>
1	In factor 6.2 endangered populations are only weighed in the scoring when there is evidence of population impacts (critical). SeaChoice recommends that where a genetically similar species is being farmed within the vicinity of an endangered wild population, the potential genetic impact risk to the endangered population should be weighed as high (0) to moderately-high (2). This ensures a precautionary approach is taken to ensure the genetic diversity of endangered populations.	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>PC2: Evidence or potential genetic introgression with endangered populations has been incorporated into a score of '0' for this criterion.</p> <p>FINAL: Evidence or potential genetic introgression with endangered</p>



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		populations has been incorporated into a score of '0' for this criterion.
1	<p>The genetic aspect of this criterion for native species is heavily focused on salmon. I'm not aware of any genetic concerns regarding escapes for other species (perhaps with the exception of mixed genetic pools of <i>P. monodon</i> across Asia and East Africa). Assessing 6.2 for native species is entirely based on genetic interactions and is challenging to assess for species other than salmon; that is, the scores are often suppressed due to theoretical genetic risk that have little or no justification for other species with less diverse population genetics.</p> <p>I don't have specific suggestions at present, but would be happy to develop some with further discussion.</p> <p>In general, the scoring here is highly precautionary. Large escape events typically occur in a very small number of farms. Present day impacts even from invasive species such as tilapia seem rare.</p> <p>An assessment can't use the recapture adjustment unless there has been an escape with which to assess the recaptures. I have no immediate suggestions, but this would be nice to change and allow assessments that have an obvious recapture capability (but no escapes) to increase the (quite tough) scoring in Factor 6.1.</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>PC2: We will continue to seek information to refine this aspect of the Escapes Criterion.</p> <p>FINAL: Factor 6.1 evaluates the potential risk of escapes, and any measures implemented to reduce the risk of a production system. If there is evidence of an escape and recapture, the recapture adjustments are now more explicitly defined in the text of the standard.</p>
2	<p>Criterion 6 Request for Comment – genetic introgression</p> <p>Please provide feedback on</p> <ol style="list-style-type: none"> 1. The additional scoring example added to the 'high concern' score (0) for the table in factor 6.2. 2. Guidance for polyculture assessments that has been inserted into the assessment guide. 	
PERIOD	COMMENT	RESPONSE
2	1. While there are plenty of examples of invasive species and their impacts, there are in fact few if any documented cases of aquaculture escapees being responsible. The potential for deleterious effects of escapes of conspecifics has been exaggerated. The documented benefits of escapees contributing to reestablishment of recovering native	1. This question has been raised by several peer-reviewers and will



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<p>species populations exceeds any documented negative effects. The introgression of deleterious genes and traits into a population is in fact non-sensical. The definition of deleterious genes is that they are less fit. And less fit genes are quickly removed from a breeding population by definition. Hardy -Wienberg equations can be used to estimate the speed with which supposedly deleterious traits / genes will decline in a population.</p> <p>Likewise, escapes of populations into environments into which the species is already established have not been proven to be deleterious. These supposedly negative impacts of escapees should not be graded as severely as they are based mostly on possible impacts.</p> <p>2. Almost all polyculture systems have been shown to be more ecologically sustainable than mono-cultures. Consideration of fewer negative points, or bonus points should be considered.</p>	<p>continue to be investigated during the next cycle of standard review.</p> <p>2. So far, polyculture has played only a minor role in our assessments, but we expect that reports incorporating polyculture will be more prevalent in our future. Detailed guidance on polyculture can be developed in the form of a broader guidance document as further assessments pilot this initial high level guidance.</p> <p>FINAL: The SFW team concludes that the risk of escapes and potential impacts are accurately reflected in Factor 6.1 and Factor 6.2 and is guided by the best available science and research. Where data does exist, impacts or lack thereof may supersede the risk of native vs. non-native. Polyculture systems guidance and scoring methodology vary depending on the criterion, information, and production system. The intent of the scoring methodology is to accurately</p>
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		describe the potential benefits of polyculture production.
2	<p>1. The "Low" concern does not mention open systems although it is possible for open systems to employ best practices, have no major escapes and independent monitoring data can show that escapees are not present in the wild. Also important to note that escapees may not be proven to be from the source farm/company under assessment. For example, DFO in British Columbia has reported more Atlantic salmon catches since a major escape event occurred in US waters.</p> <p>Atlantic salmon watch: https://open.canada.ca/data/en/dataset/f0299fb3-73b9-4977-b96a-c83bd84ebdc4</p>	<p>Open systems are not specifically mentioned in the 'low' concern category, however the situation described in the comment could apply to the 'low' concern category, depending on the robust nature of the counting methods and underlying data.</p> <p>Regarding the source of the escapees, this is indeed a difficult situation to sort out and would need to be assessed for the specific region in question.</p> <p>FINAL: Production systems can incorporate additional prevention measures to reduce the risk of escapes and are then scored accordingly.</p>
2	<p>1. Table 6.2 - Competitive and genetic information.. addition of non-native under the "very low" concern if it has been proven independently that escapees are not present in the wild and/or if previous attempts to purposely release and introduce species to area have failed.</p>	<p>The 'very low' concern category in this table is not exclusive of non-native species and would indeed be scored this way if the data are robust and publicly available.</p> <p>FINAL: Same as above</p>



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2	<p>1. SeaChoice strongly supports the additional qualifier in the scoring table.</p> <p>2. Re: "utilize a weighted average of the scores" - averaging scores has the potential to disregard serious impacts. We recommend using a 'worst case' scenario. I.e. whichever species in the polyculture has the lowest score.</p>	<p>Thank you for your comment</p> <p>This criterion is intended to assess cumulative impacts and thus Seafood Watch has decided to utilize a weighted average for incorporating impacts from polyculture systems. Utilizing a 'worst case' scenario would not align with the intent to capture cumulative impacts.</p> <p>FINAL: For polyculture assessments, each species is assessed and a score is assigned to each species.</p>
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CRITERION 7: DISEASE, PATHOGEN AND PARASITE INTERACTIONS		
GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
2	<p>Additional comment: Taking a similar approach to that of the additional qualifier in the Escapes score (unknown but potential impacts to vulnerable or endangered species), we recommend adding the following for the Disease scoring:</p> <p>Endangered populations are only weighed in the scoring when there is evidence of population impacts (critical). SeaChoice recommends that where a pathogen and/or parasite transfer is known to occur but the population impacts are unknown (and perhaps more importantly not ruled out) for any 'at risk', 'threatened' or 'endangered' wild population, a precautionary approach should be taken with the disease risk score.</p>	<p>The current scoring incorporates the health of the population and the susceptibility to disease or parasite transfer and infection. We can consider ways to further incorporate ETP species into the scoring where necessary.</p>



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	<p>We recommend adding a descriptor along the lines of 'Pathogen and/or parasite transfer occurs, with population impacts unknown - however, the wild population is listed as 'at risk', 'threatened' or 'endangered' where potential impacts would be severe. Weighing should be high (0) to moderately-high (2).</p>	<p>FINAL: In the Risk-Based table, we have modified the score of 0/10 for clarity and explicit applicability to ETP species to now read: “Discharge of water from farms with known disease events occurs, with wild hosts that are considered vulnerable, endangered, IUCN red list, etc.”</p>
2	<p>In the evidence-based assessment, suggest removing the word "morbidity" from Score 4. Current language is very similar - and could be read as the same - to score 6. Clearer differentiation of the two score definitions would be helpful.</p>	<p>Thank you for your comment; we’ll work to ensure there is more clarity between these two scores.</p> <p>FINAL: We have removed “morbidity” to a score of 4. Scores 4 and 6 out of 10 now read: Score 6/10: Pathogens or parasites cause morbidity to wild species but do not result in mortality Score 4/10: Pathogens or parasites cause mortality to wild species but have no population-level impact</p>
1	<p>The scoring options in the Evidence assessment would benefit from a review. For example, the difference between "not affected" in a score of 10 and "no physiological impact" is unclear. A score of 6 for "no mortality" and 4 for "no population-level impact" are challenging with regard to the concept of Limit Reference Points and demonstrably sustainable impacts. "No population impact" appears to be entirely sustainable? Should aquaculture be expected to have "no impact" (as some critics of SFW assessments appear to imply)?</p>	<p>PC1: We will consider this in reviewing the scoring for this criterion.</p> <p>PC2: These scoring options were evaluated and suggested changes are reflected in the second public</p>



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		<p>comment version of the aquaculture standards</p> <p>FINAL: Scoring descriptors in the Evidence-Based table have been modified. Please see the revised standard for details.</p>
2	<p>Criterion 7 Request for Comment – tracked changes</p> <p>Please review the following changes marked as Tracked Changes in the scoring table and calculation:</p> <ol style="list-style-type: none"> 1. Some language has been modified to clarify existing intent 2. Guidance for polyculture assessments that has been inserted into the assessment guide. 	
PERIOD	COMMENT	RESPONSE
2	<p>2. Add further guidance regarding how to score polyculture. Recommend the 'worst case' scenario (i.e. species with the lowest score).</p>	<p>The polyculture guidance is intended to assess all species at a cumulative level. Further clarification on this guidance will be inserted into the standard.</p> <p>FINAL: Additional guidance has been added. In summary, scoring Criterion 7 – Disease in polyculture systems will, where data allow, be species-specific (i.e. each species' score is commensurate with its own risk of impact). Where good data do not exist, individual species will still receive their own score but they will effectively be limited by the species</p>



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		which presents to greatest risk if additional species are susceptible.
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CRITERION 8X: SOURCE OF STOCK		
GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
1	Consider cleaner fish here if coming from an unsustainable fishery. Large numbers are used and killed at the end of the cycle. Alternatively ignore for now and hope hatchery production continues to increase rapidly to supply the demand.	The sustainability of wild cleanerfish sourcing has been incorporated into the scope of the criterion.
1	Criterion 8X Question 1 – Scope of Source of Stock <i>Should Seafood Watch expand the scope of Criterion 8X to include broader impacts of fishing for farm stock beyond the stock status, such as bycatch and other considerations? Which impacts should be considered? What metrics should be used? Which other research efforts, organizations, ratings or certifications, etc., could be considered or used?</i>	
PERIOD	COMMENT	RESPONSE
1	Independent verification of hatcheries should be the option. Wild juveniles for aquaculture should not be permitted. Catching individuals to allow enrichment of the Broodstock gene-pool should be allowed	<p>It is unclear what is meant by “independent verification of hatcheries should be the option.”</p> <p>Sourcing wild juveniles is scored according to how much of the industry their sourcing represents with the exception of species which settle passively.</p> <p>Sourcing individuals (for genetic preservation or otherwise) is scored according its sustainability.</p>



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		FINAL: Same as above.
1	SeaChoice supports broadening the scope to include other impacts such as bycatch, ecosystem/habitat impacts and management	FINAL: Thank you. We have expanded the scope to include impacts resulting from the intentional sourcing of species for use as part of the farming system.
1	If the use of farm-raised broodstocks is not possible, MSC certification or certification by Monterey Bay Aquarium Seafood Watch Standard for Fisheries should be the minimum requirement not to get the "Avoid" status of the Monterey Bay Aquarium Seafood Watch Standard for Aquaculture.	<p>FINAL: The use of MSC certification and Seafood Watch ratings are indeed two metrics by which we score the sustainability of sourcing wild individuals for farm stock. Please see the Guidance language in the criterion, which states the criterion will be scored with an increasing penalty according to the percentage of farmed product that uses "Wild-caught broodstock unless the number used and the sustainability of the source can be demonstrated to be of minimal concern (i.e. score of ≥ 6 in Fishery Sustainability Examples table in Factor 5.1b Source Fishery Sustainability".</p> <p>If broodstock are not sourced from a fishery that achieves a score of 6 or better according to the Fishery</p>



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		<p>Sustainability Examples table, the assessment will not automatically be rated an Avoid unless the species sourced is “endangered”.</p> <p>Endangered is defined as “Species listed as protected, vulnerable, threatened, endangered or critically-endangered by the IUCN (Red list) or by a national or other official list with equivalent categories. However, more recent or more regional/stock specific data can override these determinations.”</p>
2	<p>Criterion 8X Request for Comment – proposed language modifications</p> <p>While we have not made material changes to the intent or the content of this criterion, we have modified language to clarify the intent. Please provide comment on the proposed language modifications, as viewed as Tracked Changes.</p>	
PERIOD	COMMENT	RESPONSE
2	<p>We assume that a salmon farm that utilizes cleaner fish should follow the polyculture guidance? And that the lowest score should be applied. If this is correct, this should be explicitly stated as it is currently unclear. If incorrect, provide guidance on how to apply the score for such an example.</p>	<p>FINAL: It is currently explicitly and clearly stated. See the language in the criterion: “Polyculture systems: For assessments concerning polyculture systems (inclusive of the use of cleanerfish), conduct multiple assessments (one for each species in the system) and utilize the lowest score.”</p>

CRITERION 9X: PREDATOR AND WILDLIFE MORTALITIES



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GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
1	<p>Criterion 9X Question 1 – Evaluating Wildlife and Predator Mortalities <i>And, given that data on wildlife mortalities are typically poor, and ‘proving a negative’ (i.e. that mortalities are not occurring) is difficult, how can Seafood Watch best balance the precautionary principle while ensuring that industries are not penalized unfairly?</i></p>	
PERIOD	COMMENT	RESPONSE
1	<p>Support a risk-based/evidence-based scoring, with the understanding that more precaution must always be taken when using the risk-based methodology. If bycatch is to be considered in 8x, should it also be considered under this criterion? While there may be a potential to penalize producers who maintain thorough records of bycatch, compared to those who do not, consideration should be made. Current wording of the rationale, to consider the potential to affect the population status of the relevant species, should be used in this case. /Lack of evidence should be treated with precaution, and scores reflect the precautionary principal. Where thorough records do exist, and evidence of proper record keeping/reporting of mortalities when they occur, this data should be used. As above, thorough records should not penalize producers. Potential for interactions, anecdotal evidence could be used to guide scores for data-poor producers.</p>	<p>FINAL: The concepts of realistic precaution in the absence of data and the use of data where possible have been incorporated into the revised criterion through both the creation of a Risk- and Evidence-Based Assessment method and the respective scoring table within each assessment method.</p>
1	<p>As per [SeaChoice] data comments, where data is very poor or unknown (0 or 2.5) - this should result in a red score.</p>	<p>FINAL: Very poor data situations are inherently more likely to score poorly in the criterion, and the availability of increasingly-more information allows ‘worst-case’ assumptions to be overcome (noting that more information does not necessarily result in higher scores).</p>



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2	Criterion 9X Question 1 – evidence and risk-based options Please provide comment on: 1. The suitability of this approach and the scenarios at each scoring threshold	
PERIOD	COMMENT	RESPONSE
2	The following descriptor is scored as a -6 "Exclusion or control methods are unknown, and mortality numbers are unknown". Unknown / no data should be ranked more precautionary. E.g. -8	FINAL: After further consideration this phrase will remain in the scoring band examples for -6. If it warrants an additional update, this will be addressed in the next review cycle.
2	We agree the evidence based assessment.	Thank you.
2	Criterion 9X Question 2 – Significantly vs. substantially In the Risk-Based scoring table, we are seeking suggested definitions for: <ul style="list-style-type: none"> • “significantly” (in a score of -2, see yellow highlight) • “substantially” (in a score of -4, see yellow highlight) 	
PERIOD	COMMENT	RESPONSE
2	SeaChoice finds it challenging to suggest definitions for these given no examples or rationale as to why they are scored differently is provided. Substantial implies the impact is larger in size (e.g. a large number of mortalities within a population), whereas significant implies that it holds more meaning or importance (e.g. any mortality(ies) from an endangered population). Arguably, impacts on endangered populations should be penalized more - which is not the case as currently written.	The intent of the question was to elicit rationale (i.e. definitions) for the use of different terms that score differently. Impacts to endangered populations is indeed penalized more heavily through the use of the Potential Biological Removal metric (or



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		concept if the PBR has not been defined). FINAL: In the Risk Based scoring table concise and clear language was implemented to resolve the significant vs substantial debate.
2	We agree the evidence based assessment.	Thank you.

CRITERION 10X: ESCAPE OF SECONDARY SPECIES		
GENERAL COMMENTS		
PERIOD	COMMENT	RESPONSE
1	Consider movements of cleaner fish here - e.g. long distance movement from Sweden to northern Norway. Minor edits to the existing criterion would suffice.	Clarifying language has been implemented to ensure that the movement and parallel biosecurity risk of cleanerfish (and other biotic and abiotic materials) is assessed.
2	Criterion 10X Request for Comment While we have not made material changes to the intent or the content of Criterion 10X, we have modified language to clarify the intent. Please provide comment on the proposed language modifications, as viewed as Tracked Changes.	
PERIOD	COMMENT	RESPONSE
	<i>no comments received</i>	