Best Aquaculture Practices Certification Program
Global Aquaculture Alliance
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Comments on BAP Standards

Salmon Farm Standards

Comments concluded January 2011

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Tassal Group Ltd.

Tasmania, Australia

GENERAL COMMENTS:
The largest barrier to entry into these standards for Tassal is the required database population with Tassal operational data.

"In parallel with the implementation of these standards for salmon farms, the Global Aquaculture Alliance will establish a BAP database to provide a knowledge base for the continuous improvement that is implicit in the BAP concept. The database will allow salmon farmers, and eventually farmers of other species, to submit data anonymously on certain aspects of their operations for which evaluation by scientists might lead to better future standards."

There is an undisclosed cost associated with submitting this information along with additional traceability information. The burden of tracking and submitting information in another system other than our existing systems is burdensome and in our experience unique to any other certification process.

This additional cost of certifying to this standard will need to be examined in detail once GAA provides concrete figures and I am sure will influence a cost/benefit discussion with our customers.

BAP: *The requirement for a workable solution for this database is fully understood. The database must allow anonymous compilation of useful data to guide the development of the standard, but it must not impose unreasonable costs on program participants. The final details will be defined and approved by the Standards Oversight Committee because this issue is not exclusive to salmon.*

Tassal will be able to meet most of the GAA standards right away, as we are striving for best practices now under our existing environmental management system. The only standard we will need to work towards is the FIFO (fish in:fish out) ratio. However, with improved protein substitution in Tasmanian diets, we should be able to meet this easily in the future.

BAP: *Despite regional concerns about meeting an FIFO of 2.5, the Salmon Technical Committee was persuaded to make the FIFO limit even more demanding (now 2.0) in response to other public comments, claims by feed companies and information from other salmon farmers, as well as overall pressure to use marine ingredients with greater efficiency. The FIFO limit is set to drop again in 2016:*

5.6: (Future standard) After June 1, 2016, the facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested.

The annual compliance audit, associated fees and certification process is acceptable to Tassal.

The final major issue for us is that our feed manufacturer needs to be certified to BAP within three years of us adopting the standard. This may be difficult, as our main feed producer is Skretting, who will most likely certify to GlobalGAP in the future. Will GAA consider accepting GlobalGAP as a parallel standard for supplier certification?

BAP: *The salmon standards allows farmers to either use BAP-certified feed or to obtain feed that meets the key conservation criteria in the BAP feed standards. The GlobalGAP feed standard does not include provisions for the responsible sourcing of fishmeal and fish oil, so it would not meet the requirements of the BAP program.*

SPECIFIC COMMENTS:
4. Sediment and Water Quality

"To help move the salmon industry toward a single, widely accepted, globally applicable protocol for such monitoring, farms will in the future be asked to submit sediment-monitoring data in a standardized format to a BAP database so that researchers can evaluate the desirability of such a protocol."

This is an example of the type of data request that concerns Tassal. Above is a request to populate the BAP database with monitoring data. This request looks simple, but it is actually quite a complex dataset to request and would be very time consuming.

All the large, global salmon-farming companies are involved in ongoing, peer-reviewed environmental research, usually in association with large academic institutions and government. Tassal does not see the additional value in this approach and does not feel comfortable with GAA scientists on the other side of the world evaluating our systems from a distance.

GAA should consider having a scientific committee that evaluates global research and best practices each year, and then uses this to inform their standards. Representation from each country where BAP is adopted would bring a regional validation to the process.

BAP: *To provide more clarity regarding the BAP database, the implementation guidelines for Section 4 now include this text:*
"There is considerable interest in trying to develop one widely accepted, globally applicable protocol for monitoring the impacts on sediments under marine fish farms. Due to differences in biological community composition, hydrography, water circulation and sediment type, however, this is difficult. Nonetheless, it is thought that analysis of monitoring results from BAP-certified farms might offer some insight on how this might be done.

For this reason, farms will in the future be asked to submit sediment-monitoring data to the BAP database for use in future GAA-sponsored research to evaluate the desirability of such a protocol. Development of mechanisms for establishing the confidentiality and anonymity of the sources of such data shall precede implementation of this requirement and shall be undertaken in cooperation with existing BAP-certified farms."

And the corresponding standard is:
4.7: Data that will enable the farm's feed-based carbon and nitrogen discharge to be calculated shall be collected and recorded, and may be required to be submitted to the BAP database for future use in BAP-sponsored research."

5. Fishmeal and Fish Oil Conservation
Tassal would not be able to currently meet the fish in:fish out ratio. We are close, however we have not reached the substitution rate of our European counterparts. The industry is researching substitution options for Tasmanian diets. Tasmania's new salmon research centre is being developed to provide tank capacity for nutrition trials. Tassal is confident we can easily reach this target in the future. It is one of our top sustainability priorities. Having our feed suppliers comply with BAP standards may be a constraint.

BAP: *Please refer to the above response to your general comments.*

6. Control of Escapes
No issues, but one clarification is required: The margin of error for inventory control is too tight and does not reflect real margin of error with automated counting systems. It is at +/- 2% throughout to harvest. Some clarity is needed on how margins of error in hatchery counts will be incorporated into the final evaluation.

BAP: *The standard has been modified to:*
6.6: The applicant shall provide documents to show that the variance between the projected and actual harvest numbers of fish from the last year class harvested was less than ± 3% after accounting for known losses.
Clarification of hatchery count margins of error will be made in the salmon hatchery BAP standards that will be developed soon. Meantime, hatchery counts are to documents by reference to hatchery procedures without specification of what those procedures must be.

8. Storage and Disposal of Farm Supplies
8.11: Copper-based antifoulant-treated nets shall not be cleaned in situ at farms.
Tassal is moving away from antifoulant-treated nets – 40% of all our nets are now non-treated, and we are adopting in-situ net cleaning as an alternative.

We will have a transition period when “historically” treated, not newly dipped, cu-treated nets will be in our inventory. We believe this standard refers to regularly dipped and treated nets, and we would be O.K. using our existing nets until they are taken out of production within three to five years.

BAP: *Clarification is now provided:*
8.10: If any farm nets are treated with copper or other toxicant-based antifouling materials, cleaning procedures shall collect, treat and dispose of wash water in compliance with national regulations regarding collection, treatment and disposal of such toxic wastes.
8.11: In farms that are switching from use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ at the farm if the nets have first been cleaned ashore by approved methodsand not re-treated before redeployment.

Traceability – Record-Keeping Requirement
No issues with the record-keeping requirement, but we do not want to participate in the online traceability system, as this will be additional operational costs for Tassal and does not add value to our traceability effectiveness for us or our customers.

BAP: *The data entry requirements for the BAP online traceability system have been minimized to address producer concerns about the time, duplication and costs involved. Alternatively, participants that already have a valid traceability system can opt for a chain of custody audit, which can also function to protect the integrity of the BAP brand and program.*

St. Mary’s Bay Coastal Alliance Society

Sandy Hanson
Freeport, Nova Scotia, Canada

4. Sediment and Water Quality
The end of the Implementation portion of the standard states: “However, there may be reasons for concern about the far-field effect on water quality as well as the cumulative effect on water quality of several farms in one area.”

It is not prudent to assume that the discharging of vast amounts of fecal matter, antibiotics and chemicals into the waters only affect water quality at the site. These can be carried far afield and pose negative environmental impacts on species not just at the site.

BAP: *Agreed. New wording in the implementation guidelines for standard 4:*
However, there may be reasons for concern about the cumulative and far-field effects on water quality of several farms in one area, especially in nutrient-poor areas. In such cases, coordinated nutrient monitoring shall be included within the specifications of an Area Management Agreement (Standard 2).

5. Fishmeal and Fish Oil Conservation
Text to Change: “Salmon producers shall obtain a fish in:fish out ratio of 2.5 or less.” and “Although a BAP standard for feed conversion has not been established, producers should strive to reduce their facilities’ feed-conversion ratios as low as practicable.”

Proposed Text: Salmon producers shall obtain a fish in:fish out ratio of 1.0.
Anything more than 1.0 actually indicates that a salmon fish farm is not sustainable -- it is taking more to produce than what is being produced.

This needs to be the BAP standard, or you are in effect promoting unsustainability. (Important consideration that must be made in these Standards and Guidlines: Is BAP a steward of the aquaculture industry or a steward of the environment?)

Open-net aquaculture makes these two roles mutually exclusive. What is the role you are choosing? If you are indeed attempting to be stewards of the marine environment, then you must make your standards much higher for open-net in the interim, with the goal of moving these operations to land based closed-containment systems. That is the only way that you will truly achieve stewardship of the marine environment, sustainability and a healthy fish product.

Money needs be spent to get these operations out of the open water. They are harmful to the marine environment, period. (If they were not, there would not be dead zones under the cages.) This industry has had too long of a free ride at the expense of the marine environment, communities where they are sited and consumers. I sincerely hope that you at GAA will make a true difference in how aquaculture is practiced.

BAP: *The BAP program aims to reduce the environmental externalities of the aquaculture industry by requiring improved management and by promoting the development and application of improved technology. The FIFO limit, which has been reduced from 2.5 to 2.0 (and to 1.5 from 2016) in response to your comments and similar pressure from other stakeholders, is viewed as a significant measure of a fish farm's efficiency, and as such it should be progressively reduced (with no lower limit) as long as there are no negative impacts on the welfare or nutritional quality of the resulting farmed fish.*

Aquaculture, as a means of producing increasing volumes of seafood, is typically more sustainable than relying on the fishing industry that generates greater environmental externalities. So the promotion of aquaculture, as long as it is conducted responsibly, can be viewed as a key component of marine environmental stewardship.

It is critical that the fishmeal and fish oil that are incorporated into fish diets are obtained from responsibly managed fisheries, so BAP salmon standards actively promote certification of forage fisheries, too. Promoting aquaculture as an alternative to agriculture is also a valid response to the pressing need for global environmental stewardship.

Relevant clauses:
5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 2.0 or less for the most recent year class harvested.
5.6: (Future standard) After June 1, 2016, the facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested.

11. Control of Residue and Contaminants
Text to Change: "11.1: Antibiotics or chemicals banned in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish."

Proposed Text: 11.1: Antibiotics or chemicals banned in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish, or the marine environment of the producing country.

Furthermore, the precautionary principle shall apply in relation to allowable chemicals used to treat farmed fish. These shall NOT be discharged into the marine environment under any circumstances, but shall be handled as hazardous materials and disposed of by the company in accordance with the proper handling of hazardous materials.

The chemicals used to treat diseased farmed fish that are released into the marine environment can have significant negative impacts (including death) on non-targeted species/the marine eco-system/our food chain. Release of these are therefore a significant food safety issue (i.e., the chemicals impact not only the salmon that are being treated).

BAP: *Section 10 (covering biosecurity and disease management) defines the BAP approach to responsible use of chemicals and therapeutants. This is indeed a critical issue, but the emphasis is not on preventing these products being used, as you would obviously prefer, but on requiring documented prudent and judicious use under the direction of a fish health professional. The BAP program also encourages the use of technology that obviates the need for therapeutants. For example, see standard 10.7, where effective vaccines are available, they must be used.*

The BAP approach to controlling chemical contamination also includes the testing of finished products for residues -- the cultured fish themselves being a key indicator of any chemical misuse on the farm.

Any food production system, whether on land or sea, can be expected to have impacts. Negative impacts need to be measured, managed and minimized. In general, aquaculture has the advantage over agricultural systems that it can be conducted without wholesale displacement of marine or aquatic biodiversity, which is an improvement over most terrestrial systems, where plants and animals are produced in intensive monocultures and natural habitats are almost totally displaced (even in most organic systems).

Jamie Smith

Scottish Salmon Producers' Organisation
Perth, Scotland

The standards detail in the initial paragraphs that they cover the cage and net pen production of Atlantic salmon, chinook, coho and rainbow trout. Does this cover just the seawater phase of Atlantic salmon production? Is the freshwater phase, either tank or freshwater cage production, covered under another standard? This is particularly applicable to standard 9.3, as freshwater and seawater stocking densities vary considerably.

BAP: *This is a saltwater salmonid growout standard. Next we will deal with freshwater cage production, as well as hatcheries. I can understand why this split prompts questions, but it was difficult enough to create something that applied globally without having to apply it to different systems, as well. Many of the basics apply to all systems, but there are some obvious differences, as you point out.*

Could you give U.K. examples for standards 6.6 and 7.6? Would this be something like a marine SAC or part of Natura 2000 designation? Is it any marine protected area or just relating to salmon or a predator such as seals?

BAP: *The implementation guidelines now make it clear that the designation is with respect to wild salmon:*
6.7: The farm shall not be located within an area officially designated as "critical" or "sensitive" habitat (or equivalent terminology) with respect to wild salmon unless site-specific, valid, official documentation authorizing an exemption, supported by an environmental impact analysis, can be provided.

Yes, SACs are relevant here but unlikely to block salmon farming except in exceptional circumstances. For example, if you wanted to build or operate a salmon farm in a SAC that had been designated for salmon conservation, then standard 6.7 would prohibit this.

Standard 7.9 raises a few questions, particularly where a population of predators such as seals can change through the season, depending on available food or environmental conditions. In certain circumstances, it is not within the farmer's ability to reduce the number of predators over time.

BAP: *Clause modified: The frequency of incidences of active deterrence in which wildlife is affected shall be reduced over time unless extenuating circumstances can be demonstrated.*

Standard 10.7 details the requirement for all smolts to be vaccinated against diseases for which effective vaccines are available. What does the standard term as an "effective" vaccine? Also, where does the standard sit with regard to the P.D. vaccines currently available?

BAP: *The standard lists appropriate reference materials to be consulted. Ultimately, the opinion of the farm's fish health professional would be decisive.*

Standard 10.10 talks about the BAP database. What does this entail, who will have access to this information, and how will it be used?

BAP: *The requirement for a workable solution for this database is well understood. The database must allow anonymous compilation of useful data to guide the development of the standards, but it must not impose unreasonable costs on program participants. The final details will be defined and approved by the Standards Oversight Committee, because this issue is not exclusive to salmon. GAA will control access to the information with a view to upholding the integrity of the BAP program.*

At this stage, I am still figuring out whether the SSPO should be responding to these standards on behalf of the Scottish industry, or whether this will be up to the individual member companies to decide on their response.

Maine Aquaculture Association

Sebastian Belle
Hallowell, Maine, USA

Thank you for the opportunity to comment on the proposed standards. The comments offered are the product of a poll of our members. I would be glad to address any questions or provide further explanation if needed.

2. Community Relations
2.1: … accommodate local residents by not blocking access to fishing areas and other public resources."

Comment: Most well-run net pen operations allow traditional fishermen and other user groups some degree of access to portions of the farm site. Having said that, the installation of any farm will inherently occupy space and by definition "block access." As written, this standard is unachievable if literally interpreted by an auditor. Additionally, the standard as written may be interpreted to be contrary to guidance given in the standards implementation section: "Farms shall provide barriers that limit entry by unauthorized persons."

Suggested language: "… to the greatest extent possible, accommodate local residents by allowing access to fishing areas and other public resources without compromising farm biosecurity or employee or public safety."

BAP: *New language:*
2.1: The applicant shall demonstrate that the farm does not prevent access to fishing areas and other public resources. Where access is not direct, the applicant must provide signage and a written access plan demonstrating consideration of biosecurity and employee and public safety.

Standard 3. Community
Worker Safety and Employee Relations
3.5: "The applicant shall make provisions for medical treatment and pay wages to employees who cannot work because of injuries sustained at work or who are made redundant."

Comment: Is it the intent of this standard to require the farm to continue paying wages and medical benefits for workers who are fired or let go for ANY cause? If not, there should be a specific definition of "made redundant." In addition, there should be some time limit on the obligation the farm has to the redundant worker.

Standard 4. Environment
Sediment and Water Quality
4.1: "The applicant shall provide an independently reviewed baseline study that shows hydrographic and benthic conditions at the farm site can meet or exceed specified values in operating permits at current production levels."

Comment: This standard requires a study that "a priori" determines a farm site will be able to meet permit conditions. While intuitively this makes sense (who would want to invest in an operation that cannot meet its business permit conditions?), the standard may be unachievable for several reasons.

A. Very few, if any, reputable consultants will be willing to provide a document that assures a farm operator that they can “meet or exceed specified values in operating permits at current production levels.”

Firstly, “baseline” studies are done before any operation is actually in place and are therefore model based. Models can be useful as management tools, but rarely accurately predict how sites react to organic loading from farms until they are “adjusted” or ground truthed based on actual field sampling after loading has occurred, i.e., after a farm has started operations.

Secondly, the liability involved in a consultant assuring a farm that they will meet or exceed operating permit conditions is significant, given the fact that how a farm is operated will largely determine its ability to meet permit conditions, and the consultant has little or no control over how the farm is operated.

B. The standard appears to contain an internal contradiction. The standard requires a “baseline” (before a farm begins to discharge/load a site) study that shows a farm “can” (has the potential at some point in the future) achieve permit requirements at “current”(i.e., now) production levels. The term “current” implies a farm is up and running and has some production. This appears to contradict the idea that the study is done before operations begin.

Suggested language: The applicant shall provide an independently reviewed baseline study that characterizes shows hydrographic and benthic conditions at the farm site can meet or exceed specified values in operating permits at current production levels. This study will form the reference basis against which future environmental monitoring studies are compared in order to assess the actual environmental impact of the farm.

BAP: *The standard has now been modified to take account of these comments and differentiate clearly between new and existing farms.*

Standard 5. Environment
Fishmeal and Fish Oil Conservation
Reasons for Standard: “…there are limits to the amounts of these products the world’s oceans can supply. The BAP program therefore supports the use of protein feed ingredients derived from terrestrial sources, as well as fishmeal and fish oil produced from fish processing and fishery by-products.”

Comment: No one debates that fishmeal and fish oil supplies are limited. Alternative feed ingredients will be vital to the continued expansion of salmon farming. The BAP should not limit itself to only encouraging protein sources from terrestrial sources as alternatives. The BAP should encourage alternative sources of both proteins and lipids from both terrestrial and aquatic sources.

Suggested language: “…there are limits to the amounts of these products the world’s oceans can supply. The BAP program therefore supports the use of protein and lipid feed ingredients derived from both aquatic and terrestrial sources, as well as fishmeal and fish oil produced from fish processing and fishery by-products.”

BAP: *Agreed. The wording has been changed to:*
“The BAP program therefore supports the use of feed ingredients derived from alternative sources, as well as fishmeal and fish oil produced from fish processing and fishery by-products.”

Reason for standard: “Fish In: Fish Out” Ratio Feed-Conversion Ratio
Equation 1
“Feed-conversion ratio (year class) = Total feed use (MT) ÷ total harvested fish weight – weight of smolts (MT).”

Comment: The equation as stated does not take into account feed that was fed to fish that died before harvest. At even normal mortality levels, on a well-run farm, the weight of these fish may be significant over a whole farm. Even though mortalities may not be harvested as products, a well-run farm should not be penalized by excluding this production from their FCR calculation.

By completely excluding mortalities from the FCR calculation, the standard is penalizing farms with good production methods and low mortality rates compared to farms with poor production methods and high mortality rates. It is essentially "dumbing down" the standard and not giving an accurate assessment of important differences between different farms.

The weight of mortalities should be included in the FCR calculation up to some agreed-upon level. Beyond "normal" mortality levels, mortalities should not be included so that farms with unusually high mortality levels will be penalized through their FCR calculations.

The working group should discuss what an acceptable mortality level might be and how to deal with estimating their weights. Actual weight sampling of mortalities is probably unrealistic. A pre-determined weight schedule that estimates mortality average weights at each month post-smolt stocking may be useful. Using that approach, mortality counts could then be used to estimate total mortality weight and factored into the FCR at the end of the production cycle.

BAP: *In common with other standard methods for calculating FCRs and FIFO ratios, the BAP program considers the economic FCR to be more useful of overall system performance than the biological FCR (which allows for biomass losses due to mortality to be discounted).*

In essence, the FIFO ratio tries to compare the overall wild fish input with the overall farmed fish output so the economic FCR is more appropriate. To obtain a low FIFO ratio, it is necessary to get a good survival rate and a good FCR, and use feeds that are not too high in fishmeal and fish oil content (unless these ingredients are derived from by-products).

6. Environment
Control of Escapes
Implementation: "The components of the Fish Containment Plan shall include but are not limited to:
• A classification of the farm site based on expected maximum wave heights and currents using the method proposed in ISO/TC 234 N029 or equivalent."

Comment: ISO/TC 234 has not developed their method of estimating these parameters yet. Referencing their method is premature. NO29 is a submission made by the Norwegian delegation as part of the ISO process and references, indirectly, a separate Norwegian standard. The correct and current reference would be the Norwegian standard NS9415.

NS9415 does not reference "maximum wave heights and currents" anywhere. It does refer to wave height and current calculations for the Norwegian and near shore North Sea context. NS 9415 does reference another Norwegian standard (NS-EN 1991-1-4) for calculating 10- and 50-year wind strengths for the Norwegian coast. NS9415 does indirectly indicate the use of 10- and 50-year wave height and current calculations based on 10- and 50-year wind speeds for coastal Norway.

These are specific to the Norwegian context and may under- or overestimate 10- and 50-year wave heights and currents in other geographic areas, depending on whether their 10- and 50-year wind speeds are lower or higher than the Norwegian situation.

Suggested language: "A classification of the farm site based on maximum expected wave heights and currents using the method proposed in ISO/TC 234 N029 NS9415 or equivalent. Whatever method is used should include calculations of the 10- and 50-year wave heights and currents based on local estimations of 10- and 50- year maximum wind speeds and durations."

BAP: New wording in the Implementation Guidelines: *"A classification of the farm site based on expected wave heights and currents based on local estimates of 10- and 50-year maximum wind speeds and durations using the method proposed in NS9415 or equivalent."*

"A report from a qualified marine engineer or accredited certification body that confirms the farm structure is designed and installed to withstand the extremes described in the classification."

I have never seen such a report, and for liability reasons, it is unlikely that a report "confirming" that a farm structure is "installed to withstand the extremes" described in the site classification will be signed by either a marine engineer or certification body.

Design certifications may be achievable, but “certifying” an installation is very difficult and typically engineers use a disclaimer on their design certifications that says “proper utilization and installation to specifications required.” Certification of “installation to specifications” is rare but possible, and about the best you can normally get. Certification of installation to specifications requires extensive post-installation inspection by the engineer or certifying body, is extremely expensive and often difficult to get.

Suggested language: ”A report from a qualified marine engineer or accredited certification body that confirms the farm structure is designed and installed to withstand the extremes described in the classification. Installation specifications are appropriate given the theoretical 10- and 50-year site conditions estimated in the site classification.”

BAP: *New wording in the Implementation Guidelines: “A report from a qualified marine engineer or accredited third party that confirms the farm structure design and installation specifications are appropriate given the theoretical 10- and 50-year site conditions estimated in the site classification.”*

“Certification signed by an authorized representative of the hatchery accompanying all shipments of juvenile fish (smolts) received that states how many fish are in the shipment and the margin of error in the count. The margin of error shall not exceed ±3% and be verifiable by reference to documented hatchery procedures and records.”

“Fish inventory accounting procedures that assure counts of fish stocked and harvested, and of mortalities are as accurate as possible. Variance between the number of fish stocked and the number harvested after accounting for recorded mortalities and known escapes shall not be more than ± 2% for each year class, after allowance for the margin of error from the hatchery. The BAP goal is to reduce allowed fish inventory accounting variances in the future as equipment and procedures improve.”

Comment: Both these implementation guidelines establish counting variance thresholds and support the use of inventory numbers as a method of detecting escapes. While this approach may be appealing intuitively, in practice, it is very difficult to implement due to variability in the accuracy and consistency of different counting methods. Based on the experience we have here in Maine, we do not believe this is an effective or practical approach for a number of reasons.

1. While equipment manufactures of counting machines often make accuracy claims, our experience has been that these are inflated and rarely achieved in real applications. Indeed, hand counts of 80- to 100-gram smolts using two duplicate human counters often have difficulty in production settings consistently achieving + 5% accuracy. Counting machines can be much worse, particularly on smaller smolts.

2. Accurately verifying hatchery counts on hundreds of thousands or millions of smolts is very time consuming, expensive and significantly elevates fish stress due to repeated handling. This elevated stress negatively impacts fish health and welfare, and elevates disease risks.

Based on population statistical methods and depending on fish size, variance in fish size within “lots” and numbers within each lot, it is may be necessary to recount tens of thousands of individual fish in order to verify fish counts to the level of precision and accuracy necessary for compliance with the proposed implementation guidelines. This represents a substantially elevated risk to animal welfare and health.

3. Use of inventory discrepancies as an escape indicator only works long after the escape has occurred and significantly limits the farmer’s ability to take timely corrective action.

BAP: *Agreed, and there is provision in the standard for such timely action. However, ultimately, these procedures should be tested and verified by results. Inventory tracking provides such a test.*

While tracking inventory discrepancies may be one of many tools available to a farmer to analyze escapes and improve containment, establishing impractical thresholds that only identify problems long after they have occurred will do little to solve the problem. Instead, identifying critical control points in the salmon-growing process, developing process control procedures designed to minimize the risk of escapes such as frequent net inspections and using real-time indicators such as significant changes in fish behavior and feeding levels, are much more powerful and effective tools. If these indicators are linked to and trigger farmer responses, such as increased underwater net inspections, they allow a farmer to take corrective action to reduce or respond to an escape in real time.

Suggested language: “Certification signed by an authorized representative of the hatchery accompanying all shipments of juvenile fish (smolts) received that states how many fish are in the shipment and the margin of error in the count. The margin of error shall not exceed ± 3% and be verifiable by reference to documented hatchery procedures and records.”

BAP: *New wording in Implementation Guidelines: Inventory accounting procedures*

- *A certificate, signed by an authorized hatchery representative, shall accompany all shipments of juvenile fish (smolts) received that states how many fish are in the shipment and the estimated margin of error in the count. The margin of error shall be verifiable by reference to documented hatchery procedures and records.*
- *A projection shall be prepared immediately after a year class of smolts is fully stocked of the number of fish expected to be harvested in each year class, based on the number of smolts received and taking into account the possible error in the hatchery count, as well as other projected losses during the growth cycle.*

The above projection shall then be compared with the actual number harvested when harvesting of a year class is complete. Any variance shall be explained by reference to farm records of known losses. Variances greater than ±3% that cannot be explained shall prompt a secondary audit investigation at the applicant's expense to try to determine the cause and, if a satisfactory explanation is not found, shall result in loss of BAP certification.

“Fish inventory accounting procedures that assure counts of fish stocked and harvested, and of mortalities are as accurate as possible. Variance between the number of fish stocked and the number harvested after accounting for recorded mortalities and known escapes shall not be more than ± 2% for each year class, after allowance for the margin of error from the hatchery. The BAP goal is to reduce allowed fish inventory accounting variances in the future as equipment and procedures improve.”

Farms shall conduct a site-specific risk analysis that identifies the potential causes of fish escapes, determines their relative likelihood of occurrence at the farm site, identifies critical control points for effective escape risk monitoring and critical control points for effective escape risk reduction and effective escape response.

Farms shall further develop a containment management system based on that risk analysis that includes specific management protocols and actions designed to effectively monitor escape risks and events and to reduce these risks and respond to escape events in a timely and effective manner. Verification of the efficacy of these measures shall occur through the year-to-year recording of escape events at critical control escape-monitoring points in the production process.

Records of the number of known escapes and their causes. Three or more escape incidents (defined as escapes of 0.5% or more of the farm’s total inventory) during two consecutive production cycles or loss of more than 20% of fish in a single event shall result in suspension of BAP certification with reinstatement subject to a detailed independent engineering and operational review.

Comment: Reinstatement of BAP certification should require more than just an external review. It should include an external review with recommendations for corrective actions and documentation that those corrective actions have been taken.

Suggested language: Records of the number of known escapes and their causes. Three or more escape incidents (defined as escapes of 0.5% or more of the farm's total inventory) during two consecutive production cycles or loss of more than 20% of fish in a single event shall result in suspension of BAP certification with reinstatement subject to a detailed independent engineering and operational review, that includes suggested corrective actions designed to reduce the risk of the escapes due to the identified causes. Farms should provide written documentation that these corrective actions have occurred.

BAP: *New language, with escape limits defined in fish numbers rather than percentages:*

- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*
- *In both cases, reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review, and risk assessment to determine the cause or causes of escapes, and to recommend corrective action where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken.*

Limiting Impacts of Escapes
"Farms shall not be located in habitat areas designated as "critical" or "sensitive" (or equivalent regional terminology) with respect to wild salmon unless it can be demonstrated that this matter was considered specifically by regulators in granting operating permits and approvals. Equipment for recapturing fish and written procedures for its use shall be available as soon as it is known or expected that a large escape may have occurred, subject to legal constraints on the types of equipment that can be used."

Comment: There are currently jurisdictions that, although they may have "wild" salmonid populations, do not currently consider "this matter" while granting operating permits and approvals. For example, Chile has populations of "wild" salmonids that are not considered at all during the permitting process. The standards contain no definition of what constitutes a "wild salmon."

Significant areas in the world have sea-run salmonid populations that are maintained through hatchery programs that release millions and in some cases billions of juvenile salmonids. Although management agencies may identify certain areas associated with these restoration or enhancement programs as "critical," these are far from "wild" salmon populations. Indeed, in the case of the west coast of North America, the release of billions of juvenile hatchery salmon per year is the single largest direct human intervention in "wild" animal populations on the earth.

Likewise, on the east coast of the United States, hatchery salmon or their f1progeny represent over 99% of all returning Atlantic salmon. These populations can hardly be classified as "wild" or even "natural," given that it is well established that over 75% of natural selection (i.e., mortality) on salmonids happens before smoltification and outmigration from rivers. Hatcheries effectively shield salmon from this portion of "natural" selection and delay selective pressure until after post-hatchery release.

The fact that hatchery-based populations have significantly different population and genetic characteristics from their original "wild" foundation stocks is well established and documented. Hatchery-based programs create "hatchery" populations and do not preserve or even enhance "wild" populations. The standards should establish a clear definition of "wild" salmon populations that includes a maximum contribution by hatchery-originated fish including any f1 progeny.

Suggested language: "Farms shall not be located in habitat areas designated as "critical" or "sensitive" (or equivalent regional terminology) with respect to wild salmon unless it can be demonstrated that this matter was considered specifically by regulators in granting operating permits and approvals. For the purposes of this implementation guideline and for the rest of this standard, "wild" salmon are defined as those salmon runs that are composed of naturally spawning salmon populations that have had little or no direct stocking of hatchery-reared fish for at least two generations. Equipment for recapturing fish and written procedures for its use shall be available as soon as it is known or expected that a large escape may have occurred, subject to legal constraints on the types of equipment that can be used."

BAP: *New language in the Implementation Guidelines: Farms shall not be located in habitat areas officially designated as "critical" or "sensitive" (or equivalent regional terminology) with respect to wild salmon unless it can be demonstrated that this matter was considered specifically by regulators in granting operating permits and approvals, and that such consideration was backed by an independent environmental analysis. For the purposes of this implementation guideline and for the rest of this standard, "wild" salmon are defined as those salmon runs that are composed of naturally spawning salmon populations that have had little or no direct stocking of hatchery-reared fish for at least two generations.*

Standards: Strike the entire 6.3 standard and create a new 6.3 standard.
6.3: The margin for error in the inventory counts for the last year class of fish for which harvesting has been completed shall be within ± 2% after allowance for the margin of error in the count from the hatchery.

Suggested language: Farms shall conduct a site-specific risk analysis that identifies the potential causes of fish escapes, determines their relative likelihood of occurrence at the farm site, identifies critical control points for effective escape risk monitoring and critical control points for effective escape risk reduction. Farms shall further develop a containment management system based on that risk analysis that includes specific management protocols and actions designed to effectively monitor escape risks and events, and to reduce these risks and respond to escape events in a timely and effective manner. Verification of the efficacy of these measures shall occur through the year-to-year recording of escape events at critical control escape-monitoring points in the production process. The site-specific risk analysis, Farm Containment Management System and escape documentation record shall be made available to the standards certification auditor at any time.

BAP: *New language and clauses added to replace 6.3 and to follow the above suggestion. The standard now requires a Fish Containment Plan and sets an inventory standard and an escape limit in terms of fish numbers rather than percentage losses.*

7. Environment
Predator and Wildlife Interactions

Reasons for Standard
"Salmon farms are located along mostly undeveloped coastlines, where abundant marine wildlife is common. Some wildlife species interact with salmon farms because they are intimidated by the farms' presence and seek to avoid them, while other species are attracted to farms as habitat, somewhere to perch or hide, or a place to find food."

Comment: Show me the study that documents some wildlife are "intimidated by farm's presence." This sounds like anthropocentric eco-babble, strike the editorializing.

Implementation: "The WIP shall include but not be limited to: A map that identifies "critical" and/or "sensitive" marine and coastal habitat in the region and, if the farm is in an area so designated, a list of the classified or endangered sedentary species within a 2-kilometer radius of the farm and of mobile coastal species within the region, updated where necessary to show wildlife populations established after the farm was started."

Comment: Does coastal habitat include terrestrial habitat? If so, what is the reason for its inclusion? Show me the study that documents negative impacts of a marine farm on terrestrial habitat. Where did the 2-kilometer radius come from? What study or data was used to pick that number? What evidence is there that a farm has any impact on a "sedentary species" 2 kilometers away?

If this was a politically negotiated number in the work group, it should be dropped unless there is a study justifying it. Finally, you are asking the farmer to "map" large swaths ("the region") around the farm. Isn't that the job of the relevant resource management agency, not the farmer?

Suggested language: "The WIP shall include but not be limited to: A map that identifies "critical" and/or "sensitive" marine and coastal habitat in the region, and, if the farm is in an area so designated, a list of the classified or endangered sedentary species within a 2-kilometer radius of the farm and of mobile coastal species within the region, updated where necessary to show wildlife populations established after the farm was started."

BAP: *New language requires that the WIP shall include: "A map that identifies officially designated 'critical' and/or 'sensitive' marine and coastal habitat in the region. If the farm is in an area so designated, a list of the classified or endangered sedentary species within a 2-kilometer radius of the farm and of mobile coastal species within the region shall also be included, updated where necessary to show wildlife populations established after the farm was started."*

Standard 7.8: "The applicant shall not use acoustic harassment devices to control predators."

Comment: What is the basis for this standard? We have good data in Maine that shows that, used carefully as part of an integrated predator deterrence plan, acoustic devices can be effective. Additionally we have no evidence that they are injurious to the animals they are used to deter. With the increasing development of integrated multitrophic aquaculture, acoustic deterrents are a vital tool in avian-deterrent programs. This standard should be eliminated.

Suggested language: Strike all of standard 7.8.

7.9: "The frequency of incidences of active deterrence in which wildlife is affected shall be reduced over time."

Comment: While the intent of constant improvement is laudable, this is a case where it may actually be counterproductive. Firstly, deterrence, whether it is active or passive, is better than the alternative of non-deterrence. Second, by mandating reductions in the instances of active deterrence, the standard may be preventing a farmer responding in a responsible manner to the emergence of new predators.

For example, a farm has a predator (predator A) for which it has, over time, developed effective passive deterrence measures and as such has reduced its use of active deterrents. A new predator (predator B) targets the farm. The passive measures the farm developed for predator A are not effective on predator B. The farm responds by using active deterrents while it is attempting to develop new passive measures for predator B. Is that farm penalized for an increase in the use of active measures? The way the standard is written, it appears so.

Suggested language: Strike all of standard 7.9.

BAP: *New language:*
7.9: The applicant may only use acoustic harassment devices to control predators if independent expert opinion verifies that their use will not harm endangered, protected or threatened species or any cetaceans.
7.10: The frequency of incidences of active deterrence in which wildlife is affected shall be reduced over time unless extenuating circumstances can be demonstrated.

9. Animal Health and Welfare
Health and Welfare
Reasons for the standard: "When farmed fish are exposed to continuously poor conditions, their feed consumption and growth rates can decline. Distressed animals are also less resistant to diseases, and mortality usually increases."

Comment: Negative impacts of FCR should be added to effects of poor conditions.

Suggested language: "When farmed fish are exposed to continuously poor conditions, their feed consumption and growth rates can decline. Food-conversion ratios may also increase, negatively impacting a farm's profitability. Distressed animals are also less resistant to diseases, and mortality usually increases."

BAP: *New language in Implementation Guidelines: "When farmed fish are exposed to continuously poor conditions, their feed consumption, efficiency of feed conversion and growth rates can decline. Distressed animals are also less resistant to diseases, and mortality usually increases."*

10. Animal Health and Welfare
Biosecurity and Disease Management

Farm management measures: “The Fish Health Management Plan shall include but not be limited to written biosecurity and health management procedures, and training of farm staff in the practice of these procedures, including:”

Comment: The fish health management plan (FHMP) should also include the use of external third-party biosecurity audits. These audits should be conducted by a fish health professional other than the one responsible for the design and implementation of the farm’s FHMP.

Audits should occur annually and be designed to assess the efficacy of the FHMP, and identify any weaknesses that need to be rectified. Audit results should be made available to farm staff, owners and the BAP auditor. Audit results provide a powerful tool to facilitate continuous improvement in a farm’s FHMP and ensure the FHMP is a living document that responds to new emerging biosecurity threats.

BAP: *The risk here could be the possibility of doubling up on audits. The standards, as written now, provide for an external audit if the BAP auditor is not comfortable with the FHMP and its implementation. Your suggestion would, in effect, make this routine.*

Suggested language: “The Fish Health Management Plan shall include but not be limited to written biosecurity and health management procedures, an annual third-party external biosecurity audit and training of farm staff in the practice of these procedures, including:”

BAP: *New wording in the Implementation Guidelines: “The fish health professional shall develop and implement a Fish Health Management Plan (FHMP) that accomplishes disease prevention through biosecurity and, if needed, disease treatment.”*

“The FHMP shall include but not be limited to written biosecurity and health management procedures, and training of farm staff in the practice of these procedures, including:”

Comment: This section should also include a bullet that requires the farm to accurately and regularly track and analyze mortality rates. It sounds obvious, but it should be overtly stated.

Suggested language: Accurate and regular recording and analysis of farm mortalities and mortality rates on a cage-by-cage basis.

BAP: *Addition to the requirements of the FHMP:*
- *Procedures for the accurate and regular cage-by-cage recording and examination of dead fish recovered as “normal mortality” from the cages and for their sanitary disposal.*

Comment: Add a new standard and renumber existing standards. It makes most sense to fit it in right after standard 10.3.

Suggested Language: 10.4: Conduct annually a third-party biosecurity audit designed to assess the efficacy of the FHMP and identify any weaknesses that need to be rectified. These audits should be conducted by a fish health professional other than the one responsible for the design and implementation of the farm’s FHMP. Audit results should be made available to farm staff, owners and the BAP auditor.

BAP: *No changes made. The BAP audit, with its requirement for a properly implemented FHMP, which includes biosecurity requirements, is considered adequate. Please see also the first comment in response to your comments on Standard 10.*

10.10: “The applicant shall have or be working toward the establishment and implementation of an Area Management Agreement that incorporates coordinated production and fallowing cycles, sea lice treatments, data sharing and, where considered necessary, nutrient monitoring.”

Comment: The inclusion of “nutrient monitoring” in a disease and biosecurity management standard is irrelevant and unnecessary, strike it.

Suggested language: 10.10: The applicant shall have or be working toward the establishment and implementation of an Area Management Agreement that incorporates coordinated production and fallowing cycles, sea lice treatments, data sharing. and, where considered necessary, nutrient monitoring.

BAP: *New wording in the Implementation Guidelines for Standard 10: "However, there may be reasons for concern about the cumulative and far field effects on water quality of several farms in one area, especially in nutrient-poor areas. In such cases, coordinated nutrient monitoring shall be included within the specifications of an Area Management Agreement (Standard 2)."*

12. Traceability
Record-Keeping Requirement:
Comment: This section mandates the collection and reporting to a BAP-controlled database of a significant amount of data to facilitate product traceability. Product traceability is vital for customer confidence in product safety in modern seafood markets. Several well-established traceability systems currently exist and are used widely to achieve full traceability.

The BAPs appear to be mandating use of a BAP traceability system which has yet to be developed. The design, confidentiality and implementation of that system are not clear. It is premature to mandate participation in a system that has not been developed yet.

It seems appropriate to require participation in a traceability program, but NOT to mandate which specific program is used. Instead, the standards should articulate the key components and capabilities of a traceability program that are necessary to achieve BAP certification.

Standard: "Traceability records shall be maintained via the BAP-approved online traceability system for each of the specified parameters for every production unit and every production cycle to allow tracing of fish back to the unit and inputs of origin."

Suggested Language: "Traceability records shall be maintained via the BAP-approved online traceability system. Such a system must, at a minimum, enable the traceability of any individual fish back through for each of the specified parameters for any every production unit and every production to allow tracing of fish back to the unit and inputs of origin cycle it has been a part of. The approved traceability system must also enable the tracking of the parameters specified in the BAP guidance and include methods that shield commercial proprietary data."

BAP: *The requirement for a workable solution for this database is well understood. The database must allow anonymous compilation of useful data to guide the development of the standard, but it must not impose unreasonable costs on program participants. The final details will be defined and approved by the Standards Oversight Committee because this issue is not exclusive to salmon.*

Lyons Seafoods

Smoked Salmon Technical Director
Warminster, Wiltshire, U.K.

I have read through the BAP Salmon Farms Guidelines. It's a standard that has been under development by the Global Aquaculture Alliance for about five years. There are many salmon codes of practice within the industry. The main ones that we use are:
1. RSPCA Welfare Standards for Farmed Atlantic Salmon
2. EUREGAP – Integrated Aquaculture Assurance
3. Organic Farmers and Growers
4. Tesco COP for Farmed Salmon
5. A Code of Good Practice for Scottish Finfish Aquaculture

In principle, all the salmon standards are very similar. They all have similar requirements for animal welfare, farm management, environment management, feed and feed management, and health. One particular key difference between some of these standards is in the way in which they are audited. The compliance of RSPCA, EUREGAP and Organic schemes are all audited by ISO / EN45011-accredited certification bodies.

In general, our customers only really accept the RSPCA, EUREGAP and organic salmon standards. However, I am aware that the retailers are working more closely with WWF and the Global Aquaculture Alliance salmon standards. I recall also being part of various meetings between Tesco and the GAA with regards to adopting this standard (when I was at Cumbrian Seafoods).

The GAA shrimp standards were well established and internationally recognized as the best standard. However, Tesco moved away from the GAA salmon standards. The main issue being that the Aquaculture Certification Council (the auditing body) was not accredited. It would appear that this has now been addressed.

Summary & Comments of the Best Aquaculture Certification Standards,
Guidelines
1. The standard and BAP certification has been developed by the Global Aquaculture Alliance.
2. The audits are carried out by ISO-accredited certification bodies.
3. A database has been set up to give feedback and drive continual improvement.
4. The COP covers Atlantic salmon, chinook salmon, coho salmon and rainbow trout.
5. This COP covers good detail on environmental and social impacts. This COP tends to lean more to the environment. It has a lot of aspects that are covered in the ISO 14001 standards.
6. Non-compliances are raised as critical, major and minor.
7. The audit covers various aspects of farming regulations, such as licenses, permits, environmental impact assessments.
8. The audit also has a section on community. This also covers ethical aspects such as worker safety and employee relations. This is an aspect that would not normally be covered in the other farming standards.
9. The environmental section could perhaps be more detailed. More detail on pH, oxygen levels could be stated.

BAP: *For other species, the BAP program applies strict water quality standards for effluents, but these are not appropriate for salmon cages. Instead, to address any cumulative impacts the standard specifies:*

"There may be reasons for concern about the cumulative and far field effects on water quality of several farms in one area, especially in nutrient-poor areas. In such cases, coordinated nutrient monitoring shall be included within the specifications of an Area Management Agreement (Standard 2)."

We have not tried to set specific water quality targets, knowing that circumstances vary in different countries. The details of the water quality-monitoring requirements will be included in the Area Management Agreement that BAP farms must join (or create). To detect and address negative environmental impacts, the BAP standard places more emphasis on benthic monitoring than on water quality monitoring.

10. Section 5 covers fishmeal and fish oil conservation. Again, this appears to be the only standard that covers this.
11. More detail on what should not be included in feed would be recommended, and good practices of feed management are also recommended. Example – feather meal is not permitted, growth hormones are not allowed, etc.

BAP: *The BAP salmon standards explicitly outlaw the use of any banned chemicals that could result in harmful residues in fish. Note that feather meal and poultry by-product meal are permitted in North America but not in Europe, illustrating the danger and difficulty of being too specific on a global basis. A ban on the use of growth hormones is implied in Standard 11.1, but not stated specifically. In any case, growth hormones have never been used in salmon feeds because they don't work.*

12. Section 6 covers the control of escapes. This is good.
13. Section 7 covers predators and wildlife management. Again, good. Perhaps more detail on the seal management could be included.
14. Section 8 deals with storage and disposal of farm supplies.
15. Section 9 covers health and welfare. This section is good but the RSPCA standard is much more detailed.

BAP: *The RSPCA plan covers many aspects of husbandry under the general title of welfare. Much of what is included is in the BAP draft in Standards 5, 6, 7, 9, 10 and 11. Much of the detail in the RSPCA would also seem difficult to audit. For example, E 3.6: "Biofouling must not be allowed to build up on enclosure nets."*

16. Section 10 is biosecurity and disease management. Generally good.
17. Section 11 covers control of residues and contaminants. Overall, it's generally a good standard. It also covers other areas, such as ethical, 14001 etc. However, it's not as specific or as detailed as the RSPCA, EUREGAP and organic salmon standards.

Personally, I think the standard will be difficult for the industry to accept in this country. Possibly an opportunity for Chile salmon farmers and trout farmers. However, I predict that the Norwegian and Scottish salmon growers will tend to stay with the EUREPAP, RSPCA and organic standards.

Dawn Purchase

Marine Conservation Society
Ross-on-Wye, Herefordshire, U.K.

5. Fishmeal and fish oil conversion
In the interim of adopting GAA feed mill standards, suggest that standard states sourcing from IFFO RS-certified producers.

BAP: *The standard now permits either the use of feed from a BAP-certified mill or the use of feed that meets the fishmeal and fish oil conservation criteria (Standard 3) of the feed mill standards. Thus, certified sources of fishmeal and fish oil are actively promoted.*

Suggest developing a section on the use of non-marine proteins and oils. What is allowed? What about sourcing of ingredients such as soya? Will LAPs be permitted? What about GMOs? Are you aiming to reduce fishmeal and fish oil usage in total or just from non-certified fisheries?

Suggest that all wild capture fisheries be excluded from Equation 2 IF they are MSC-certified using the low trophic index assessment methodology currently being developed.

BAP: *The standard aims to encourage reductions in the amount of wild fish that are used to produce a given quantity of farmed salmon, even if the sources of the wild fish are certified. At first sight, it may appear inconsistent that BAP farm standards place the emphasis on marine feed ingredients rather than all feed ingredients, including terrestrial ones. However, the sustainable use of fishmeal and fish oil in aquafeeds is consistently presented as the main constraint to sustainable growth of the aquaculture industry.*

This accounts for the attention that BAP standards place on responsible sourcing of fishmeal and fish oil, and efficient transformation (as estimated in FIFO ratios). Once progress has been made, it is likely that later versions of BAP standards will address the sustainability of all feed ingredients. There is no plan to exclude MSC-certified marine ingredients from the FIFO calculation. Although these ingredients may be responsibly sourced, there should still be an incentive to use them sparingly.

Relevant clauses:
5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 2.0 or less for the most recent year class harvested.
5.6: (Future standard) After June 1, 2016, the facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested.

6. Control of escapes
Suggest adding a section that requires an induction for all new staff and training for all existing staff on escape prevention, site and net inspection, equipment handling and installation, and post-escape mitigation. Ideally, this training should be in a formalized training course with a certification of competence awarded. Most escapes are caused by human error. Standards must push towards better training to minimize this.

BAP: *Agreed. New wording: The fish containment plan must include:*
- *Boat equipment that includes guards on propellers and staff training procedures that minimize the risk of contact between boats and farm nets (see Standard 3).*
- *A training program for all staff on all procedures in the Fish Health Containment Plan.*

The corresponding standard reads: 6.3: The applicant shall provide documents to show that all staff members have received training in the Fish Containment Plan, which shall be verifiable by a training certificate in employees' files and verified at audit by a subset of interviews.

7. Predator and Wildlife Interactions
• Suggest allowing the use of those acoustic deterrent devices that are currently under development in Scotland (and elsewhere) that do not adversely affect cetaceans but are species specific for pinnipeds.

BAP: *Agreed. Clause 7.9 modified:*
7.9: The applicant may only use acoustic harassment devices to control predators if independent expert opinion verifies that their use will not harm endangered, protected or threatened species or any cetaceans.

Suggest requirement for allocating one member of staff to carry out any lethal control and for that staff member to be trained in humane slaughter methods.

BAP: *Agreed. New requirement for the Wildlife Interaction Plan:*
Designation of one member of staff to carry out lethal control measures, if needed, and for training of that individual in humane slaughter methods.

9. Animal Health and Welfare
Stocking density of 25 kg/m^3 is very high! In Scotland, the stocking density is 15 kg/m^3 rising to a maximum of 17 kg/m^3 just prior to harvest. This is in line with Freedom Food standards for welfare of farmed salmon.

The Farm Animal Welfare Council's findings indicate no adverse welfare implications up to 22 kg/m^3 for salmon. However, you have to consider the increased disease risk and loss of efficacy of sea lice treatments with high stocking densities above 15 kg/m^3.

BAP: *New wording added to the standard to clarify that 25 kg/m^3 is conditional on good welfare indicators:*
9.9: The applicant shall apply stocking density criteria based on local conditions, which shall normally be at or below an average 25 kg/m^3 but may rise higher than this for 5% of the production cycle if the fish show other good welfare indicators and water quality is considered good.

Jack Rensel, Ph.D.

Rensel Associates Aquatic Sciences
Arlington, Washington, USA

Commenter's qualifications:
Dr. Rensel works in both business and academic realms, in the U.S. and overseas. His regular clients include the largest seafood company in the U.S. (Pacific Seafood Group), the largest U.S.-owned and operated fish-farming company (owned by Icicle Seafoods), academic organization such as Woods Hole Oceanographic Institution and private non-profit environmental organizations such as Hubbs SeaWorld Research Institution and Earthjustice Hawai'i.

He conducts aquatic research project contracts for NOAA, USDA and other agencies and is a recognized international expert regarding harmful algal bloom dynamics, effects on fish and effects of fish culture on the environment. His company has long been involved in benthic and water column monitoring at fish farm sites in Puget Sound and at other locations worldwide, including the Caribbean Sea.

Dr. Rensel is the U.S. member, appointed by U.S. NOAA, on the ISO panel determining international protocols for net pen aquaculture. He was a principal participant in the work group that set the first U.S. NPDES standards for net pen aquaculture (in Washington State in 1995) after conducting 10 years of annual impact analyses at several farm sites.

He was co-chair of the Joint Subcommittee on Aquaculture Net Pen working group that worked with EPA to set U.S. aquaculture standards and BMP requirements. His work includes development and use of AquaModel 4D aquaculture effects simulation modeling with his partners at the University of Southern California, the U.S. Naval Academy and Woods Hole Oceanographic Institution. See www.AquaModel.org.

Introduction: Thank you for the opportunity to review these Best Aquaculture Practices proposed standards and guidelines for salmon net pens. I restrict my comments to section 4 of the proposed standards, dealing with environment: sediment and water quality. There are four comments as follows:

Comment 1: Use of different standards and monitoring protocols in different ecoregions
The proposed standards have recognized that different protocols and endpoints (standards) are used in different economies and jurisdictions worldwide. However, it is stated: “To help move the salmon industry toward a single, widely accepted, globally applicable protocol for such monitoring…”

While it might seem to be desirable to have a single set of protocols and standards that could be used worldwide for salmon pens, it would not be biologically possible or advisable due to the fundamental differences in physical circulation, water chemistry and biology throughout the many different ecoregions that occur in salmon-farming regions worldwide.

The ecoregion concept is one that is widely recognized in physical, chemical and biological oceanography in both academia and government, and seeks to encompass various subregions, for example, on the U.S. west coast north versus south of Point Conception, California. Profound differences in the response of the ecosystem to organic enrichment or eutrophication is seen among these regions, driven principally by differences in water temperature, but also many other factors, including nutrient flux, salinity, rates of physical circulation, bathymetry, etc.

The draft standards recognize that different physicochemical protocols are used in different situations, but some further explanation is necessary why this is required. First, it is due to the fact that no single chemical measurement (e.g., sulfides) is suitable for all types of sea bottom habitats. Probe methods such as sulfides or redox were specifically developed for use in sea bottom areas with a prevalence of silt and clay fines, and are not particularly reliable for sandy bottoms that are associated with higher mean and peak water currents.

Such sandy areas are often “better” than silty areas for both fish culture and reduction of possible adverse effect because the wastes are distributed more widely, where they can be aerobically incorporated in the food web compared to quiescent sites, where no resuspension occurs, and the risk of anaerobic conditions at the sea bottom is much higher.

Other measures, especially total organic carbon determination, work equally well for sand or silt/clay bottoms, but are felt by some to be too expensive. The state of Washington regulatory system has long used this measurement for its screening tool, but does default to benthic infauna analysis for stations that indicate an exceedence of the trigger threshold values. I also have used this measurement in the Caribbean Sea, and find it works well there, too, if samples are properly treated to remove inorganic carbon in carbonates. Nevertheless, most jurisdictions seem focused on the use of sulfide measurements, despite the limitations described above.

Comment 2: Allowable areal extent of adverse sea bottom effects.
The draft standards say: “The goal in all cases is to ensure that there is no impact on sediment chemistry and biology outside the allowable zone of effect.” An “allowable zone of effect” (or sediment impact zone in U.S. NPDES parlance) is an area that surrounds an outfall or source of discharge that is usually set by a regulatory agency after reviewing technical studies of existing extent and what is achievable using best available technologies, if available.

The draft standards are correct that there should be no “impact” on sediment chemistry, but especially biology, outside the zone. However, there are semantic problems with the statement because the words “impact” and “effect” are used in the same sentence. The word “impact” connotes adverse influence, while the word “effect” has no inference on the nature of the influence and therefore can be “good or bad.”.

Low levels of organic enrichment, as first described by Pearson and Rosenberg (1978), can actually stimulate greater abundance AND diversity of benthic organisms, but when the rate function is too great, diversity will decline. The Pearson/Rosenberg relationship has been proved several times since (Grizzle and Penniman 1991, Diaz and Rosenberg 1995, Nilsson and Rosenberg 2000, Magni et al. 2009).

So this amounts to a balancing act, sizing the production to fit the environment and not reduce water or sediment quality to the point where significant areas are adversely affected and the cultured fish, which are most at risk in the pens, suffer poor growing conditions. Thus, I suggest the following amendment to the goal statement: “The goal in all cases is to ensure there are no adverse biological effects outside an allowable sediment impact zone.”

We should actually care more about biological impacts than measurements of sediment chemistry. Sediment chemistry is just a surrogate indicator for biology, which is supposed by many to be too difficult and expensive to measure. The problem, in my opinion, is not that infauna identification is difficult or expensive, but rather, once you have it, what is to be done with the data?

Comparing to a “reference” station is commonly done, but because of biogeographic and physical differences, these are often uninformed and meaningless comparisons. Biologists attempt to reduce the data to a single index or set of indices, but this is often unsatisfactory and an artificial construct, as discussed below in comment 3.

Often the topic of the extent of a sediment impact zone is brought up in such discussions. What we see in practice is that the stronger the currents, the less the measurable impact for a given fish production rate or size of farm. Studies at a few British Columbia sites with low mean velocity flows showed impacts at much further distance than at other sites with better flow.

But one should not expect to put a rectangular box around a farm to describe waste distribution footprint. Tidal or non-tidal energy is rarely distributed in a normal fashion around fish farms, so that the footprint may be shifted. In Washington state, the Department of Ecology provides for a “shifted” footprint to accommodate this naturally occurring phenomenon, although it has not been utilized to date. For example, if there was a dominant flow to the east and a minor flow to the west, a grower could elect to shift the sediment impact zone some nominal distance from west to east.

Sediment impact zone extent determination is partially a technical judgment, i.e., what can be achieved in an efficient operation and partly a societal trade-off judgment in which society acknowledges that some degree of impact may occur in the affected area, but that there is a societal value to the food made available, jobs supported, taxes paid on production, etc. In my experience, there are a few locations that have no measurable adverse effects, but other farms have at least some modest adverse effect either directly below or adjacent to the farm site.

The Washington Department of Ecology made the decision many decades ago to allow fish farms in less-sensitive areas and to encourage siting where currents are strong. This worked out well for society, as these locations are universally NOT in back bays, inlets and shallow areas that have little extra organic waste assimilative capacity.

Comment 3: Use of diversity indices in standards.
Presently the draft states: “Prescribed monitoring protocols differ from country to country. Determination of organic accumulation in sediment under salmon farms may be measured in terms of sulfide, Redox potential, total organic carbon or total volatile solids, or by visual inspection with video documentation. These measurements are then often correlated with biological impacts through the use of indices for species diversity such as the AZTI Marine Biotic Index.” (Emphasis added.)

The draft implies that indices of species diversity are often used and that they are used in regulatory authority evaluation. Biologists and researchers have for many decades sought to devise numerical indices that assimilate benthic infauna community data into a simplified ranking or result, generally with very poor success, but none of these indices are yet suitable for regulatory use, and none are used in North or South America, Australia, New Zealand or Japan to the best of my knowledge, although in some jurisdictions, they may be reported in associated technical reports.

The draft cites one particular European method that was developed mainly for sewage outfalls, and I believe even the authors of this method would not agree that it is useful in all cases or that it should be used without links to other method (See Borja et al. 2004). I recommend striking the last sentence from the above passage because it is, as presently used, misleading.

As pointed out years ago by Dr. Donald Weston, a respected pioneer in net pen impact studies, sewage discharges from municipalities or industry contain a far more complex and potentially hazardous array of chemicals, micronutrients, pharmaceuticals and toxins than fish net pens produce, and to lump them in the same category is misleading.

In Washington state, the only state in the United States with long-standing and formal sediment standards for all industries (WAC 173-204-320, see references) and where total organic carbon is used as a surrogate chemical indicator of net pen effects, if threshold trigger values are exceeded, benthic infauna sampling is initiated at the subject pen site and at a suitable reference area. A combined measure of species diversity and abundance is utilized as the final metric to establish and statistically test for impact. In this manner, it is the actual data, not some constructed index, that is used to statistically determine if an adverse impact has occurred and if mitigation is required.

Comment 4: New farms study and prediction or meeting standards.
The standards say: “New farms shall have completed a baseline study, with review by an independent expert, that describes hydrographic and benthic conditions at the farm site and shows that the farm can meet or exceed benthic standards required by its operating permits at current or proposed production levels.” (Emphasis added.)

Unfortunately, such a requirement is not achievable with any degree of accuracy by experts or consultants, given the present state of the art. The best approximation is available through model simulation, and to the best of my knowledge, only Scotland requires this for new sites.

The most widely used model for salmon net pen impact prediction does work relatively well in depositional environments (i.e., slow currents that do not allow for regular resuspension of wastes), but it is not useful at higher velocities that are arguably better for both the cultured fish and limitation of benthic effects (Chamberlain and Stucchi 2007). This model, known as DEPOMOD, is also a closed-code model and not presently under development (pers. comm., Chris Cromey to J. Rensel 2010).

I have been working with a team of scientists for several years to develop an open-source model that will be useful for both depositional and erosional sea bottom environments, and unlike other models, predicts both water column (oxygen, nitrogen and plankton) effects as well as benthic (total organic carbon and sulfide) effects, but it is presently still being refined and tested.

It has many advanced characteristics, unlike the other model previously used, such as separate tracking of waste feed versus fish feces and ability to incorporate regional circulation model linkage or multiple current meter inputs. With a minimum of amount of data (a bathymetry map, current meter file of suitable extent, pen layout and production scheme), we could provide a reasonably accurate prediction of probable effects, but perhaps there are alternative methods.

For example, if the current meter records and bathymetry were similar to another farm nearby or in the same ecoregion, a comparison could be made of known results from the existing farm to the proposed farm, but this is not very satisfactory, as it would be most unusual to find near-identical conditions in separate areas.

In practice, fish farms are permitted, sited, operated and, after reaching approximate annual steady state production levels (if not fallowed), may begin to exceed established limits of benthic impacts. One or more of the following adaptations are then regularly exercised. Production levels are lowered and pens are reconfigured, realigned or shifted to adjacent areas with better current flows or more depth. Stocking density is adjusted, or fallowed for a period of time to allow benthic recovery and waste assimilation.

Although these approaches are less precise than modeling a farm site in advance, they remain valid methods if the frequency of monitoring is sufficient to detect change in a timely fashion. If the perimeter of the sediment impact zone is set at a reasonable distance, then the degree of benthic perturbation beneath the farm will be less than if an excessively large impact zone is allowed, because there tends to be a correlation between distance from farm and reduction of impact.

Such zones are established at 30 meters in Washington state, based on what farms could achieve in the mid-1990s, and other jurisdictions in North America have subsequently followed suit. But because of differences in water temperature, current velocity and benthic infauna and epifauna assemblages worldwide, it would not be appropriate or practical to promulgate standards or protocols from North America to other jurisdictions.

A possible approach for establishing acceptable protocols, however, would be to utilize the nearly completed work product of the International Standards Organization committee that has been working on this: TC 234/WG 2 Environmental monitoring of the seabed impacts from marine finfish farms (available upon request, but not formally published yet). This document is an expert consensus of suitable, presently available and accurate tools to measure bottom impacts or effects, and clearly demonstrates, through inclusion of several different methods, that no one simple method is suitable for all habitats, regions and ecoregions.

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Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington.
Chapter 173-204 WAC, Sediment Management Standards. 12/29/95.
Chapter 220-76, WAC. Aquaculture.12/24/02.
Chapter 173-221A WAC, Wastewater Discharge Standards and Effluent Limitations, 10/31/95.

BAP: *In response to these detailed comments, the approach to benthic monitoring has been refined and no attempt (at this stage) made to impose specific methods that may be entirely inappropriate to local conditions. The Implementation Guidelines now specify: “Since different methods or combinations of methods may be required by different jurisdictions, based on local hydrographic or benthic conditions, no preferred method is specified in this standard, only that whatever method is used shall be undertaken using standard methods of sampling and analysis that conform to generally accepted international standards.”*

And the following note has been added to the standard:
(Note: It is expected that an ISO standard for 'Environmental monitoring of the seabed impacts from marine finfish farms,' [ISO/TC 234/SC N 85 - ISO/CD 12878] will be finalized within two years, when it may be appropriate to require its protocols for this BAP standard. This will be kept under review by GAA, and the above requirements shall apply in the meantime.)

Global Aquaculture Performance Index

Lenfest Ocean Program
Pew Trusts

For more detailed information please visit the GAPI website: http://web.uvic.ca/~gapi/ .
GAPI Indicator Relevant Initiative Criteria Data used for benchmarking assessment points of clarification.

ANTI
If used, drug treatments shall be based on recommendations and authorizations overseen by the fish health professional, who shall be guided by the FHMP and principles of best practice for his or her profession (Standard 11) and prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations.

Standard country data was applied. No specific list of prohibited antibiotics is provided in standards.

Antibiotics or chemicals banned in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish.

BOD
Collect and store data from which the farm's feed-based carbon and nitrogen discharges can be calculated for possible future submission to the BAP Salmon Database. This means recording the carbon and nitrogen content of feed fed, the weight of all fish harvested plus dead fish removed during farming, less the weight of the smolts stocked. Frequent or continuous monitoring of dissolved-oxygen concentration and at least daily monitoring of water temperature and salinity.

Applied 2.5 as FCR value (fish in:fish out). Need clarification if this is, in fact, the FCR and should be used in this calculation.

The farm shall not be located within an area designated as "critical" or "sensitive" habitat (or equivalent terminology) with respect to wild salmon unless site-specific, valid documentation authorizing an exemption can be provided.

Monitoring for organic accumulation and biological diversity in sediments immediately beneath the farm and at prescribed distances from it shall be undertaken at the time of peak feeding during the production cycle and following a fallow period between cycles.

CAP
No relevant criteria. Standard country data was applied.

COP
Procedures for washing nets treated with copper or other toxicant-based antifouling materials. Antifoulant-treated nets shall be cleaned out of the water at a licensed off-farm net-cleaning establishment, or on the farm if equipment and procedures are in place to treat the wash water and collect the solid waste before disposal. In all cases, methods of collection and treatment shall comply with national or regional regulations governing the disposal of toxic wastes.

Standard country data was applied.

ECOE
Although a BAP standard for feed conversion has not been established, producers should strive to reduce their facilities' feed-conversion ratios as low as practicable.

Applied 2.5 as FCR value (fish in:fish out). Need clarification if this is, in fact, the FCR and should be used in this calculation.

ESC
Local rules notwithstanding, the applicant shall demonstrate that the farm meets the BAP procedural, performance, documentation and reporting requirements for escape prevention outlined in the guidelines. These include adequate facility design, regular net inspections and maintenance, and fish inventory processes.

Using the 10% of production per year for losses converted this into number of individuals based on an average harvest weight of 2.5 kg.

The applicant shall demonstrate by reference to detailed stock records that there have not been three or more escape events of 0.5% or more of the farm's total inventory during the last two production cycles The applicant shall demonstrate by reference to detailed stock records that there has been no single escape event of 10% or more of the farm's total inventory.

Equipment to address a large fish escape shall be readily available, and farm staff shall be trained in its use. The applicant shall have a written plan that describes actions to be taken immediately in the event of a large escape.

FEED
BAP-certified salmon farms will be required to use only feed from certified feed mills within three years of the implementation of these salmon farm standards. In the interim, farms that are not using feed from BAP mills shall obtain documents from their feed suppliers that state all non-marine ingredients used at inclusion rates over 10% and all marine-derived ingredients used at inclusion rates over 1% are traceable to their sources.

3.4: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal and fish oil derived from reduction fisheries shall come from approved certified sources.

3.5: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal or fish oil derived from fishery by-products such as trimmings and offal shall come from approved certified sources.

After June 1, 2015, 50% of all fishmeal and fish oil from reduction fisheries shall be certified as compliant with approved standards. The preferred approved standard is the Marine Stewardship Council Environmental Standard for Sustainable Fishing (ISEAL compliant), provided it is combined with the MSC chain of custody compliance for the producing factory.

The plans of action must address how to avoid:
- use of fishmeal or fish oil sourced from illegal, unreported or unregulated fisheries, or by-products from such fisheries and
- fishmeal or fish oil sourced from fish or fish by-products from fisheries designated by the International Council for the Exploration of the Sea (ICES), Food and Agriculture Organization (FAO) of the United Nations, National Marine Fisheries Service of the United States, International Union for Conservation of Nature or Commission for the Conservation of Antarctic Marine Living Resources as "subject to overfishing," "overfished," "harvested unsustainably," "fishery closed," "stock overexploited," "no fishing recommended," "stock critical," "endangered" or "critically endangered"

Used standard country data for feed species. This is not a standard, just a recommendation, so data was not changed.

Although a BAP standard for feed conversion has not been established, producers should strive to reduce their facilities' feed-conversion ratios as low as practicable. Each year, farms shall calculate and record a year class fish in:fish out ratio using Equations 1 and 2 below. In the absence of better, specific data from the feed supplier, the transformation yields for industrial fish to fishmeal and fish oil should be 22.5% and 5.0%, respectively.
Currently using transfer coefficient value from standard country data. Not sure if fish in:fish out is the same as the transfer coefficient used in this indicator. Criteria has maximum allowable value of 2.5, not sure if this should be applied as the transfer coefficient or the FCR? Or neither?

The facility shall calculate and achieve a final fish in:fish out ratio of 2.5 or less for the most recent year class harvested.

INDE
Although a BAP standard for feed conversion has not been established, producers should strive to reduce their facilities' feed-conversion ratios as low as practicable.

Applied 2.5 as FCR value (fish in:fish out). Need clarification if this is, in fact, the FCR and should be used in this calculation

PARA
If used, drug treatments shall be based on recommendations and authorizations overseen by the fish health professional, who shall be guided by the FHMP and principles of best practice for his or her profession (Standard 11) and prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations.

Standard country data was applied. No list of prohibited parasiticides is provided in the standards.

Antibiotics or chemicals banned in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish. The applicant shall demonstrate compliance with national or regional rules designed to minimize parasite reproduction and optimize control.

PATH
The applicant shall record data on disease outbreaks and actions taken so this information can be made available to the BAP database, when it is established.

Standard country data was applied.
The applicant shall demonstrate compliance with national or regional rules designed to minimize parasite reproduction and optimize control.

BAP: *The BAP salmon standards have been modified in various ways that would improve the GAPI score of participating farms. GAPI has 10 dimensions. Taking them in turn:*

1. (Antibiotic usage) The BAP salmon standard does not permit the use of banned antibiotics. In addition, it promotes vaccination instead of antibiotic usage.

2. For copper antifoulants the following restrictions apply:
8.10: If any farm nets are treated with copper or other toxicant-based antifouling materials, cleaning procedures shall collect, treat and dispose of wash water in compliance with national regulations regarding collection, treatment and disposal of such toxic wastes.
8.11: In farms that are switching from use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ at the farm if the nets have first been cleaned ashore by approved methods (Standard 8.10) and not retreated before redeployment.

And the standard notes: The use of toxicant-based antifoulants will no longer be allowed at BAP-certified farms once the utility of alternatives is fully established. This will be a priority consideration at the first review of these BAPs.

3. Regarding biochemical oxygen demand, BAP section 4, covering sediment and water quality, specifies how any negative impacts of settled and dissolved wastes should be monitored and managed. This allows a flexible response to local site-specific conditions to be applied and tackles actual impacts rather than theoretical organic loading.

4. Regarding capture-based aquaculture, the FIFO limit has been reduced from 2.5 to 2.0, and it will fall to 1.5 in 2016. The relevant clauses specify:
5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 2.0 or less for the most recent year class harvested.
5.6: (Future standard) After June 1, 2016, the facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested.
5. Similarly for ecological energy, the BAP standard applies downward pressure via the FIFO ratio.
6. For escapes, the standard now specifies an inventory standard (+/-3%) and limits escapes in terms of numbers of fish rather than percentages of fish:

6.6: The applicant shall provide documents to show that the variance between the projected and actual harvest numbers of fish from the last year class harvested was less than ± 3% after accounting for known losses.

And the Implementation Guidelines specify:
- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*

7. Industrial energy. The BAP salmon standards, via the FIFO limit, encourage the use of fishery by-product meals and oils rather than meals and oils derived from whole forage fish. If the Industrial energy inputs of the fishery are allocated to co-products on the basis of economic values rather than mass (which they should be), then the BAP FIFO limit will lead to reductions in this indicator, too.

8. Parasiticides. The indicated GAPI formula for this refers to copper. See comments above on copper.

9. Pathogens. This indicator increases in response to the numbers of escaped fish, so the BAP provisions on escapes (see above) are relevant here.

10. Sustainability of feed. The BAP provisions on the sourcing of feeds containing certified fishmeal and fish oil have an impact on this indicator. The specific clauses (for which details are given in the Implementation Guidelines) are in the feed mill standard:

3.3: The applicant shall develop and implement a clear, written plan of action defining policies for responsibly sourcing fishmeal and fish oil.
3.4: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal and fish oil derived from reduction fisheries shall come from approved certified sources.
3.5: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal or fish oil derived from fishery by-products such as trimmings and offal shall come from approved certified sources.

British Columbia Ministry of Agriculture

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An observation that standards and codes are going to be quite variable between countries – some with more strict guidelines than others and thus an unlevel playing field may result between BAP-certified farms. This is contrary to the opening statements, which note that BAP standards strive to be consistent with best international practices.

Consideration for this in the opening and general remarks. In the descriptions of each standard, the implementation and reasons are well laid out, but the standards do not always seem to be complete in terms of the stated intentions or objectives.

BAP: *Agreed. The standards have been edited to improve the consistency between the Implementation Guidelines and the actual clauses of the standards.*

Legal Compliance, Continuous Improvement
The fourth paragraph notes: "...submit data anonymously...." Does this mean data is submitted anonymously or coded to protect the anonymity (i.e., identity) of the source? The standards need to take into consideration confidentiality and protection of data submitted to the proposed database, especially if it's a requirement for certification. How this information will be released and used by third parties must be very carefully considered and clear terms of reference established. Revise text, develop terms of reference (possible in an appendix).

BAP: *The requirement for a workable solution for this database is well understood. The database must allow anonymous compilation of useful data to guide the development of the standard, but it must not impose unreasonable costs on program participants. The final details will be defined and approved by the Standards Oversight Committee because this issue is not exclusive to salmon.*

Further, to provide more clarity regarding the BAP database, the Implementation Guidelines for standard 4 now include this text

"BAP Database: There is considerable interest in trying to develop one widely accepted, globally applicable protocol for monitoring the impacts on sediments under marine fish farms, though, due to differences in biological community composition, hydrography, water circulation and sediment type, as described above, this is difficult. Nonetheless, it is thought that analysis of monitoring results from BAP-certified farms might offer some insight on how this might be done.

For this reason, farms will in the future be asked to submit sediment-monitoring data to a BAP database so that researchers can evaluate the desirability of such a protocol. Development of mechanisms for establishing the confidentiality and anonymity of the sources of such data shall precede implementation of this requirement and shall be undertaken in cooperation with existing BAP-certified farms."

General comments – Best Aquaculture Practices certification
"Critical non-conformity"

Critical non-conformities are defined as "critical food safety or legal issues, or a risk to the integrity of the program." However, the preceding page identifies that the standards "specifically address" "environmental and social responsibility, animal health and welfare, and food safety." Thus, other areas, and in particular, environmental and animal health and welfare, should also be included in the terms of reference for critical non-compliance. For example, extreme negligence leading to environmental harm, or disregard to animal health and welfare.

BAP: *The examples you describe could indeed qualify as critical non-compliances. However, critical non-compliances are rare (an auditor may only see one or two in a career), and from experience, it is usually a food safety issue that triggers a critical non-compliance. Hence, food safety is mentioned here. No BAP certificate can be issued until non-compliances are resolved, irrespective of whether they are classified as critical, major or minor.*

Preamble
Overall this standard will be difficult to "standardize," given the scope and range of permitting requirements from region to region. The standards need to establish a minimum standard and validation of requirements within a regional/local authority. If the onus is on the farm, this may result in differences of opinion on what's required.

1. Community
Property
This section covers waste disposal, protection of sensitive habitat, effluents, etc. There are no standards identified for these.

1.1. What happens when land claims are not clearly delineated for a region? If, for example, a local group asserts title over a tenure/lease occupied by a farm and disputes the legality of the occupation, will this trigger a critical non-compliance? The standard must specify who gives legal dispensation of the "land" in a region to avoid non-conformance grey areas.

BAP: *This is certainly an important issue, but it can be argued that it is beyond the scope of a voluntary salmon farm standard to define who gives legal dispensation of the land in a region. Farmers must provide documentary evidence to satisfy the auditor that they are operating legally and have relevant property rights or land or water use rights.*

Preamble
Regardless of how proactive the farmer is in the community, there will always be opponents. Thus, are the concerns of opponents in the community valid? Has the farm taken reasonable steps to address them?

The standard needs to provide a mechanism to deal with limited conflict where such conflict does not represent the consensus view of the community, and where the farmer is operating within accepted legal boundaries and has taken appropriate steps to mitigate against concerns. Ultimately, the standard may have to accept that all conflict may not be resolved.

Revise standard to allow for conflict where appropriate and reasonable steps have been taken to address the conflict/issue.

BAP: *The standard takes a slightly different line. While it does not suggest that every conflict can be resolved, it does lay down requirements for potentially fruitful exchanges between farmers and local objectors, and it requires a proactive approach:*
2.3: The applicant shall demonstrate interaction with the local community to avoid or resolve conflicts through meetings, committees, correspondence, service projects or other activities, with meetings conducted annually or more often.

2. Community Relations
General
What about view corridors, farm site aesthetics? Need to define "blocking access to fishing" – is this physical or through actions? For example, the use of a licensed and legally applied chemotherapeutant may be construed as blocking access to a fish stock.

2.1. Does this cover aspects of navigation? What about respect for traditional uses by indigenous people?

BAP: *Clause reworded:*
2.1: The applicant must demonstrate that the farm does not prevent access to fishing areas and other public resources. Where access is not direct, the applicant must provide signage and a written access plan demonstrating consideration of biosecurity, employee and public safety.

2.3. Conflicts will be unavoidable. It should be reasonable interactions.

BAP: *Agreed. New wording:*
2.3: The applicant shall demonstrate interaction with the local community to avoid or resolve conflicts through meetings, committees, correspondence, service projects or other activities, with meetings conducted annually or more often.

2.4. Use of "Reasonable" is vague; needs to be defined. There will be a limit on information associated around the business and other aspects of the company that cannot or should not be shared. Perhaps this should be reflected in the document.

BAP: *Agreed. New wording:*
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.

3. Community
Worker – General
Subjective terms such as adequate living conditions will result in inconsistencies. More perscriptive guidelines might be necessary, especially where local laws may be substandard and inadequate.

BAP: *Agreed. The Implementation Guidelines provide more detail about the requirements:*
"Living quarters shall be well ventilated and not overcrowded or exposed to safety hazards. They shall provide adequate shelter and clean washing (e.g., shower) and toilet facilities. Food services, if provided, shall provide wholesome meals for workers at prices that do not exceed local standards. Trash and garbage shall not accumulate in living, food preparation or dining areas (see Standard 8)."

3.3. "The employee's local language" may not be appropriate in all cases. The language should be the official language of the country/region. There has to be a responsibility of the employee to speak the official language of the country/region. If an employee insists on speaking an unofficial language, which under the standard would not be considered unreasonable, then they would create a safety hazard to themselves and others on the site, most of whom probably do not speak that language.

This section requires some careful wording so that it is reasonable, but does not discriminate against official languages.

BAP: *Agreed. The standard now refers to "predominant language" instead.*

3.5. Local law will take priority. Severance needs first to follow the local labor laws. If, and only if, there are no local laws, severance should be reasonable, where "reasonable" is properly defined. Revise wording. Define reasonable.

BAP: *To help address this, greater clarity is now provided:*
3.6: The applicant shall comply with local laws regarding severance payments to full-time employees who are made redundant through no fault of their own and/or for payment of two weeks wages for every year worked, to a maximum of 20 weeks, where no such laws exist, or where the law provides for less than this minimum benefit.

3.12. Should specify compliance with local workplace safety regulations, and at a minimum "all work locations," including transport vehicles and vessels.

3.14. Descents? (Stated as ascents.)

BAP: *Diver safety manuals usually refer to ascents, probably because they are the most dangerous part, which must be conducted with great care.*

3.19. Perhaps should be minimum standards defined.

3.22. There should be terms of reference in relation to the shower requirement. E.g., do all offices need/require showers? Revise text so that the requirement for showers is related to the type of workplace and is supported by sound reasoning. E.g., for on-site living quarters.

3.23. How will this be assessed? Consideration needs to be given in the text on how the adequacy of meals will be assessed.

Can't the GAA technical committee review the available standards and suggest a common approach? At least for the type of monitoring to be carried out and the sampling regimen? Values can be set regionally, but based on performance-based measures, since the baseline will fluctuate from environment to environment.

The difficulty here (and elsewhere) is the notion that the standards are "science-based" as noted on page 1, yet defer to regional requirements – which may not be science-based. Given that environmental assessment standards have been developed for most regions, suggest that the GAA Technical Committee undertake a comprehensive review to develop a common standard that, in consultation with regional authorities, would meet the regional standard, or could be used in part to fulfill regional requirements.

BAP: *Agreed. GAA needs to develop a database. The Implementation Guidelines for Section 4 now include this text:*
"BAP Database: There is considerable interest in trying to develop one widely accepted, globally applicable protocol for monitoring the impacts on sediments under marine fish farms, though, due to differences in biological community composition, hydrography, water circulation and sediment type, as described above, this is difficult. Nonetheless, it is thought that analysis of monitoring results from BAP-certified farms might offer some insight on how this might be done.

For this reason, farms will in the future be asked to submit sediment-monitoring data to a BAP database so that researchers can evaluate the desirability of such a protocol. Development of mechanisms for establishing the confidentiality and anonymity of the sources of such data shall precede implementation of this requirement and shall be undertaken in cooperation with existing BAP-certified farms."

Preamble
Do all regional permits prescribe monitoring standards? Benthic sediments standards should be in relation to deviations from baseline values – not absolute values as suggested by the preamble text. This is especially critical if a region doesn't have a standard, or the standard is out of date with current thinking/practices.

Wording should be revised to take a more generic stance to focus on the needs for a standard that follows the regional standard, and if not available, sets a performance-based standard relative to baseline survey information.

BAP: *The need for a generic approach when a region doesn't have a standard is now reflected in the reworked Section 4. Standard 4.1 also calls for clear definition of local benthic impact "trigger levels."*

In implementation section, "Farms shall provide … three years of monitoring data." Is that two growout cycles before BAP will consider certification? Is there intent that farms must fallow between production cycles?

BAP: *For fallowing, the main requirement is for coordinated action, and the main driver for fallowing is biosecurity to break disease cycles. By default, this means that there will be sediment recovery, too. Also, because in year 1 of the production cycle biomass will be low, most of this first year represents a period of less-intensive site use:*
4.8: Production cycles, fallowing and nutrient monitoring shall be coordinated with the other neighboring BAP applicants or certified farms, or with members of an established AMA (see Standard 2).

4. Environment
Sediment -- General
Subjective measurements – monitoring based on locally required protocols, generally accepted sample collections? Should these be more specifically defined?

The "Farm Site Inspection Checklist" is out of date as a result of the transfer of aquaculture licensing jurisdiction to the federal government.

4.1. See general comments

4.2. Peak feeding or peak biomass? Whichever term is used, at a minimum, should be defined.

BAP: *"Peak feeding" is preferred.*

Fallow period – how long? Should be based on sediment performance standard with a minimum period regardless.

BAP: *Please see fallowing comment above.*

4.2. How will the "prescribed distances" be determined in order to be consistent across locations?

BAP: *The reference to prescribed distances has been removed.*

4.3. Should there not be standardized criteria as opposed to using various regional approved methods?

BAP: *Ideally, yes, but for reasons explained in Section 4, this is difficult. Therefore, standardization is a future goal if further data analysis supports it or if ISO proposes something helpful.*

4.6. What does "production cycles" mean? Define terminology to reduce ambiguity in standard.
For the BAP "database" to be of any value, data collected needs to be standardized, otherwise collected data will have limited interpretation potential/value. The database concept needs to be "fleshed out" with clearly established terms of reference, guidelines and policies for data submission and use.

BAP: *Agreed. This is critical.*

5. Environment
Fishmeal – General
The preamble should be clarified that fishmeal/oil should come from by-products where possible and that where they come from wild fisheries, the fisheries must be sustainable (emphasis on “must”).

BAP: *The standard promotes sustainable sourcing of fish ingredients by requiring feeds from BAP-certified feed mills or from feed suppliers that satisfy these three clauses (full explanations given in Implementation Guidelines):*
3.3: The applicant shall develop and implement a clear, written plan of action defining policies for responsibly sourcing fishmeal and fish oil.
3.4: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal and fish oil derived from reduction fisheries shall come from approved certified sources.
3.5: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal or fish oil derived from fishery by-products such as trimmings and offal shall come from approved certified sources.

Revise text: “required to use only feed from certified feed mills.” Is three years enough time to get feed mills certified? Link for the Fish In:Fish Out Ratios Explained document does not work.

BAP: *The requirement now is to either obtain feeds from BAP-certified mills or to meet the fishmeal and fish oil conservation criteria of the BAP feed mill standards. The link to the IFFO website and FIFO document has been updated -- http://www.iffo.net/downloads/100.pdf.*

5.1. For equation 2, is it practical to know the relative amounts of wild fish vs. by-product derived meal and oil in feed? This may simply not be practical at the farm level. This requirement needs to be validated to ensure this is practically feasible. This standard will ultimately depend on compliance by the feed-manufacturing sector.

BAP: *Agreed. This standard will not work unless the aquafeed industry is involved. There are good indications that this industry is keen to participate.*

5.3. Amount and characterization of feed used and production reporting may be excessive/intrusive. What is the goal with the use of the information? If it’s being asked for, there should be an explicit reason. Revise text to provide rationale.

BAP: *This requirement is consistent with the need to calculate a fish in:fish out ratio. Most farms will already keep records of feed types and quantities used. The characteristics of additional interest here are the inclusion rates of fishmeal and fish oil derived from wild fisheries (excluding by-products).*

6. Environment
Escapes -- General
Genetically modified salmon. Fish treated with recombinant technology-derived medicines, and vaccines in particular, might fall under the definition used for transgenic (“artificial transfer of genetic material”). Revise text: Need to include fish treated with medicines/vaccines derived from recombinant technology as not included in the definition of transgenic.

BAP: *Veterinary advice received was "Recombinant vaccines are created by utilizing bacteria or yeast to produce large quantities of a single viral or bacterial protein. This protein is then purified and injected into the patient, and the patient's immune system makes antibodies to the disease agent's protein, protecting the patient from natural disease."*

Therefore, there is no transfer of genetic material and therefore no GMO. Situations where there is or may be such a transfer of genetic material are a different matter and are best dealt with if and when they arise.

The B.C. Fisheries Act – Aquaculture Regulation is no longer wholly in use. Suggest referring to the federal Pacific Aquaculture Regulation: http://lawslois.justice.gc.ca/PDF/Regulation/S/SOR-2010-270.pdf and conditions: http://www.pac.dfompo.gc.ca/aquaculture/licence-permis/docs/licencecond-permis-mar-eng.pdf.

BAP: *Further advice indicated that the correct reference is now Fisheries and Oceans, Canada. Pacific Aquaculture Regulation. http://www.gazette.gc.ca/rp-pr/p1/2010/2010-07-10/html/reg2-eng.html.*

6.3. Reconciliation inventory deviation of +/-2% may be too tight. Might not be too bad when combined with hatchery counting error. However, if numbers are out – is this a major or minor deficiency? Consider revising the tolerance so that if reflects realistic practices with a view to tightening the standard over time.

BAP: *The inventory standard has now been set at +/-3% after allowance for hatchery error.*

6.4. Escape tolerance must take into consideration factors such as malicious damage into account – and not necessarily result in certification being revoked. This in particular will cause a problem if the standard is farm-, region- or company-based. One incident could strip the certification for a company in a region: Is that the intent of the standard?

BAP: *The standard's Implementation Guidelines specify that where escape limits are exceeded, the cause shall be investigated by an independent examiner. In both cases, reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review and risk assessment to determine the cause or causes of escapes, and to recommend corrective action, where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken. Malicious damage would generally be considered outside the farm's control and therefore reinstatement of certification would be allowed.*

The issue of the use of the certification seal (farm/company/product) should be addressed in the program documentation.

BAP: *For guidance on the use of the BAP seal, we prefer to refer people to the GAA website: http://www.gaalliance.org/bap/retailmark.php.*

6.5. "Critical" and "sensitive" need to be defined, or alternative wording used.

6.6. Revise/update text. How will "critical" or "sensitive" habitat be defined? Concern that that this could be influenced by local anti-aquaculture interest groups.

BAP: *Must be an official designation. The wording on critical and sensitive habitats has been changed and now states:*
Farms shall not be located in habitat areas officially designated as "critical" or "sensitive" (or equivalent regional terminology) with respect to wild salmon unless it can be demonstrated that this matter was considered specifically by regulators in granting operating permits and approvals and that such consideration was backed by an independent environmental analysis.

6.8. Efforts to recapture escaped farm fish are largely impractical. Resources are better put at prevention. There should be reporting requirements and elements should include drug record reporting.

BAP: *Agreed. The emphasis is now firmly on prevention.*

7. Environment
Predator -- General
7.6. "Critical and sensitive habitat" needs a clearer definition. Revise text.

BAP: *This has been further defined as officially designated as critical and sensitive.*

7.8. I believe this is legal in B.C. and is one of few directives that is not predicated with "unless legally approved" or similar statement.

BAP: *The standard now contains these five clauses relating to predators:*
7.6: The applicant shall actively favor passive and/or non-lethal methods of predator control. No controls, other than non-lethal exclusion, shall be applied to species listed as "critically endangered" or "endangered" on the IUCN Red List or that are protected by local or national laws unless specific written permission for such control is granted by the regulator.
7.7: If lethal control is necessary and justified, the applicant shall only use lethal methods of control that are legally approved.

7.8: The applicant shall record, and report when required, the species and numbers of all avian, mammalian and reptilian predator mortalities including accidental mortalities.
7.9: The applicant may only use acoustic harassment devices to control predators if independent expert opinion verifies that their use will not harm endangered, protected, or threatened species or any cetaceans.
7.10: The frequency of incidences of active deterrence in which wildlife is affected shall be reduced over time unless extenuating circumstances can be demonstrated.

7.9. What does "active" deterrence mean? Suggest referring to words used in the reasons for standard section to assist clarity, e.g., '"interaction/entanglement," etc.

BAP: *Please see predator clauses above.*

8. Environment
Storage – General
Disposal of chemicals and similar hazardous waste must first comply with local laws, and in the absence of specific requirements, in an environmentally acceptable manner. Revise text.
8.1. No mention of material safety data sheets. Material safety data sheets (MSDS) should be on site and included in the Material Storage, Handling and Waste Disposal Plan.

BAP: *This is now included.*

8.11. Animal welfare considerations should be a subcomponent of the Fish Health Management Plan under the direction of the designated fish health professional.

BAP: *This priority reflects the standard formatting for BAP farm standards. The whole BAP program gives prominence to Animal Health and Welfare as one of the four key drivers for the development of aquaculture standards (the others being social and environmental issues and food safety). This is now addressed in Section 9 -- see Implementation paragraph 1.*

Suggest decoupling Water Quality Management Plan from the fish welfare components/considerations.

9. Animal Health
Health -- General
What constitutes "important water quality parameters" – this needs to be defined in the Water Quality Management Plan. Define " important water quality parameters."

9.1. What would the specified limits be?

9.2. The water quality-monitoring plan should identify those parameters of interest and to be monitored.

9.3. A maximum stocking density of 25 kg/m^3 +5% deviation is too restrictive and could very well penalize good performance. Further, based on current data, is it realistic? Revise the standard to link it to historical site data in relation to performance data.

BAP: *This is certainly a difficult metric to set, but please note that other comments (e.g., Dawn Purchase, Marine Conservation Society) consider 25 kg/m^3 to be high.*

9.4. Is there a "science-based" reason for daily reporting? Intervals should be specified in the plan.

BAP: *The requirement now is for at least daily inspections and reports under the direction of the fish health professional. To inspect the fish less than once per day would be considered less than careful husbandry under BAP standards.*
9.4: Trained staff shall make at least daily inspections and reports on the culture facility, water quality, and behavior and condition of fish.
9.5: Staff status reports on the facility, water quality and fish conditions shall be documented, investigated and addressed by the FHP and/or farm management.

9.8. Not clear. Consider revising for clarity.

10. Animal Health
Biosecurity -- General
The scope of the Fish Health Management Plan seems limited. The former B.C. Ministry of Agriculture and Lands (now B.C. Ministry of Agriculture) developed a suite of documents for the development of Fish Health Management Plans for salmon farms in B.C. While they are no longer applicable to the provinces mandate following the transfer of management and regulation of the industry to the federal government, these could be considered by the GAA.

Overall, the Fish Health Management Plan should include stock assessment prior to arrival on site, biosecurity provisions, vaccination, animal welfare considerations, routine monitoring and treatment where indicated. Provision should be in place for dealing with high and unexpected mortalities and the presence of notifiable disease and/or disease agents as determined by the regional authority. For further details, refer to B.C. Ministry of Agriculture and Lands Fish Health Management Plan documentation.

BAP: *These elements are part of the FHMP, details of which are given in Section 10.*

The use of vaccines is too restrictive – final determination for use should be under the discretion of the designated fish health professional. In many instances, vaccines are deemed technically effective, but often clinically ineffective or not relevant for the region (see comments below). Revise text to stress the importance of vaccination as part of a comprehensive Fish Health Management Plan as determined by the designated fish health professional.

BAP: *Agreed. New wording in the Implementation Guidelines regarding the FHMP:*
- *Vaccination of fish before they are brought onto a farm and revaccination during the growth cycle, if needed, at the direction of the FHP.*

Area Management Measures
"Must implement a fallowing regime." Definition?

10.1. Designated or accredited fish health professional? – Inconsistent use of terminology. Revise text so that it is more consistent. The text should define that the designated fish health professional is either accredited or licensed by the governing regulatory authority in the region/country.

BAP: *Agreed. This inconsistency has been corrected.*

10.2. What are the qualifications for a designated fish health professional?

BAP: *The FHP shall be qualified as a veterinarian or hold an equivalent qualification. The relevant text in the Implementation Guidelines now reads:*
Biosecurity and disease management shall be carried out under the direction of a veterinarian, or fish health professional (FHP) with equivalent qualifications, who is either accredited or licensed by the governing regulatory authority in the region/country and who has the legal authority to prescribe the use of medicines.

10.4. Consideration/comment should be made for reporting exotic/reportable pathogens if encountered.

BAP: *Agreed. Corresponding text in Implementation Guidelines:*
Additionally, the FHP shall ensure compliance with all legal requirements for disease testing, fish movements (including zoosanitary regulations of inbound and outbound transports), treatments for fish diseases and reporting of notifiable diseases, if these are identified or suspected.

10.7. Vaccination should be at the discretion of the designated fish health professional, based on best clinical practices. Should a fish be vaccinated just because a vaccine is available? There has to be some clinical judgement/discretion to justify vaccination. For example, should an ISA vaccine be used on the West Coast of Canada, where ISA has not been reported?

Smolts should be free from clinical disease. Revise text to stress the importance of vaccination as part of a comprehensive Fish Health Management Plan, as determined by the designated fish health professional.

BAP: *Agreed. New wording in the Implementation Guidelines regarding the FHMP:*

- *Vaccination of fish before they are brought onto a farm and revaccination during the growth cycle, if needed, at the direction of the FHP.*

How feasible is it to vaccinate all the fish?

10.10. Disease records: confidentiality, proprietary business information. As noted above, the proposed database must take into account submission and use by third parties to ensure that confidential proprietary business information is not used in an inappropriate manner.

BAP: *Agreed. Please refer to previous comments on the database.*

10.13. Reason for standard. Where chemotherapeutants are concerned, only those products used should have been authorized by the competent authority – which have reviewed safety, efficacy and toxicity – and have assigned maximum residue limits and minimum withdrawal times. As such, all other compounds are effectively "banned" except those prescribed under extra-label use provisions (Extra Label Drug Use).

The standards need to consider ELDU provisions very carefully, and in the context of what's acceptable and what's not. For the contamination context, I would reverse the focus – only those approved for use in food animals are permitted for use to emphasize safety considerations.

BAP: *Standard 10.8 states: If used, drug treatments shall be based on authorizations by the FHP, who shall be guided by the FHMP and principles of best practice for the veterinary profession and who shall prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations (See also Section 11).*

Therefore, the FHP is responsible for ensuring that drug treatments that may be used are properly used and for documenting such use so that it can be audited. It was considered that such local professional judgment was likely to be more accurate, current and informed than prescriptive standards under these BAPs.

11. Food Safety
Control -- General
Knowing what is "banned" is difficult, since chemicals are more likely to not be approved. Specifying importing country rules? May be difficult – but might work if there is a specific banned product.

For example, malachite green maximum residue limits are very different from country to country.
I think this is best resolved by using two standards – 1) Only use that which is approved.
2) Not using "banned" chemicals.

BAP: *The standard now makes explicit reference to malachite green as a banned substance.*

Dallas E. Weaver, Ph.D., P.E.

Scientific Hatcheries
Huntington Beach, California, USA

I would like to add my comments to the draft standards. In particular, I would like to comment on the long-term inconsistency of the proposed standards, given the technical reality of a future in which we will have another 3 billion mouths on this planet and another 2 billion who want more meat and seafood.

If we don't want to use more land area, we are going to have to maximize all the food conversion efficiency we can get, with a minimum of waste products to deal with. In the proposed standards, you want to minimize fishmeal and the fish in:fish out ratio. You also want to minimize water pollution, including phosphorous pollution. The bottom line is you will have to increase plant-based protein sources in the feed. However, doing that adds non-digestable phytate phosphorous to the diets, which requires you to add phosphate in order to balance the diet. That will result in higher waste P in the fecal material.

You then set a GMO standard for genetically modified salmon. Cage farms shall not stock transgenic fish, which are defined as fish that have been genetically modified by artificial transfer of genetic material from a different species. Sex-reversed salmon and their offspring, and organisms created by hybridization and polyploidy are not transgenic salmon.

If you want to minimize fishmeal and not increase pollution from P, you will have to add a phytase gene to salmon, as has been done in pigs (recently by Canadian researchers for the same reason). The residence time in the salmon gut is probably too short to make use of added live bacteria to break down the phytase phosphorous, so we will be stuck with using GMO. Wild fish don't eat vegetable protein sources, so having that gene is irrelevant.
I view all these anti-GMO standards as a short-term sop to the eNGO's and very detrimental to the long-term future of aquaculture. The competition for aquaculture in the long term is from other meat suppliers, like pork and chicken. If they can improve their animals' digestibility of plant-based phosphorous sources and we can't, we lose in the long term.

If you still need to placate some of the eNGOs, you could ban genetic modifications, which would significantly improve the competitiveness of the modified salmon in the wild environment. If, on the contrary, as is so often the case, the modification makes them less competitive, i.e., they have to eat a lot in the winter or the diet must contain vegetable materials or they spend metabolic energy converting vegetable oil to long-chain omega-3 fatty acids, the modification would pose no threat to the wild stock because of the survival disadvantage of the modified fish.

This is especially true in areas which have no wild Atlantic salmon, notably, the entire Pacific basin. If you are really stuck by the eNGOs, you can make the GMO standard for the Atlantic basin for Atlantic salmon or native Pacific species in the Pacific basin, but not to regions without native stocks.

I also think the whole fishmeal standards are irrelevant in terms of the reality, which is that aquatic diets, like other animals diets, are just linear programming optimization problems. Aquaculture is doubling every seven years and already uses over 50% of the fishmeal and close to 80% of the fish oil. The trend is to reduce fishmeal in aquatic diets. In the next 20 years (a factor of 8 or so increase in aquaculture feed demand), fishmeal will be a minor component of all diets (flavoring?).

Fishmeal production has been constant for more than 30 years. The only thing that has changed is the market. Instead of feeding the meal to chickens, as has been done to a greater degree in the past, the meal has been diverted to aquaculture.

BAP: *It is true that FIFO ratios for salmon and other aquaculture species will continue to decline over time due to the limited supplies of fishmeal and fish oil. Although this trend is primarily driven by economics, the BAP standards can help to lead the way and they can, importantly, also support separate initiatives, such as fishmeal and fish oil certification programs that promote sustainable exploitation of forage fisheries.*

The best solution is obviously to use GMO "vegetarian" salmon which can metabolize phytate P, desaturate and elongate vegetable fats to long-chain omega-3 fatty acids, detoxify some of the anti-nutritional factors in plants and utilize carbohydrates better. Utilizing cooking of the diet, we can get the digestibility sufficient to be absorbed in the relatively short gut of salmon.

BAP: *This set of standards is for marine cages, which, given the likelihood of escapes, are not considered an appropriate place to rear G.M. salmon until such time as assurance of no escape is possible or the harmlessness of GMO salmon is demonstrated. This is the viewpoint of existing salmon farmers, eNGOs and the companies currently developing G.M. salmon. Despite this, GAA is not opposed to the farming of G.M. species, as long as the necessary environmental and food safety safeguards are in place and as long as consumers can make informed choices.*

Atlantic Canada Fish Farmers Association

(Formerly New Brunswick Salmon Growers Association)
Pamela Parker
Letang, New Brunswick, Canada

3.6: Casual or short-term workers shall receive wages, training, benefits and rights equivalent to the terms for other employees.

Suggest amendment to read: Casual or short-term workers shall receive wages, regulated/legislated benefits, training and rights equivalent to the terms for other employees.

Rationale: In Canada, all employees have access to universal health care, disability, etc. through government-regulated benefit plans. However, some companies offer additional health care benefits such as dental plans that are tied to hours worked. While these are classified as “benefits,” we do not believe they fit within the intent of this standard and therefore definition of benefits is required within the standard.

BAP: *Agreed. Revised:*
3.7: Casual or short-term workers shall receive wages, regulated/legislated benefits, training and rights equivalent to the terms for other employees.

3.22: Running water, toilets and shower facilities shall be readily available to employees.

Suggested amendment to read: Running water, toilets and shower facilities shall be readily available in housing provided to employees and provided within reasonable distance for employees working at stand-alone salmon farm sites.

Rationale: When salmon farms are close to shore and communities, running water and showers may not be available at the salmon farm site itself or on the work vessel. However, these facilities are within a reasonable distance from the farm.

BAP: *Agreed. New wording:*
3.23: Running water, toilets and washing (e.g., shower facilities) shall be available to employees either at the farm, on workboats or onshore where farms are located close to the shore.

4.2: Monitoring for organic accumulation and biological diversity in sediments immediately beneath the farm and at prescribed distances from it shall be undertaken at the time of peak feeding during the production cycle and following a fallow period between cycles.

Suggested amendment to read: Monitoring of sulphite and/or redox in sediments immediately beneath the farm and at prescribed distances from it shall be undertaken at the time of peak feeding during the production cycle and following a fallow period between cycles.

Rationale: Although sediments below salmon farms in Atlantic Canada are examined for chemical content, their biological diversity is not measured.

BAP: *Agreed. New wording:*
4.4: Monitoring of sediment conditions shall be undertaken at the time of peak feeding during the production cycle and shall be conducted according the requirements of the farm's operating permits, or according to its own plan in countries or regions where sediment monitoring is not required and as specified in the implementation requirements.

5.1: The applicant’s facility shall use feed that indicates its wild fishmeal and fish oil content or feed fish inclusion factor.

Comment: This information is not currently on the feed labels and would be a new addition that would require cooperation with feed companies.

BAP. *Agreed. This standard will not work unless the aquafeed industry is involved. There are good indications that this industry is keen to participate.*

7.6: The applicant shall provide site maps or other documentation that show the farm is not within an area designated as “critical” or “sensitive” habitat (or equivalent).

Suggest amendment to read: The applicant shall provide site maps or other documentation that show the farm is not within a geographic area that has been designated as "critical" or "sensitive" habitat.

Rationale: The insertion of "geographic" ensures that this standard is not used to prevent a farm from operating in an area where critical or sensitive species may reside or frequent.

BAP: *Agreed. New wording:*
7.3: The applicant shall provide site maps or other current documentation that show the farm is not within a geographic area officially designated as “critical” or “sensitive” habitat (or equivalent), or that it complies with the requirements of Standard 7.4.

8.11: Copper-based antifoulant-treated nets shall not be cleaned in situ at the farm.

Suggest an amendment is provided to define “cleaned.” This would ensure that farms may continue the practice of light brushing of farm nets to remove small or minor debris that may occur while ensuring that heavy cleaning is only conducted when nets are removed from the marine system.

BAP: *The corresponding clauses now specify:*
8.10: If any farm nets are treated with copper or other toxicant-based antifouling materials, cleaning procedures shall collect, treat and dispose of wash water in compliance with national regulations regarding collection, treatment and disposal of such toxic wastes.
8.11: In farms that are switching from use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ at the farm if the nets have first been cleaned ashore by approved methods (Standard 8.10) and not retreated before redeployment.

10.1: The applicant shall designate an accredited fish health professional to oversee the Fish Health Management Plan, direct the diagnosis and treatment of fish diseases and coordinate activities with neighboring farms under an Area Management Agreement, where such an agreement is in place. The applicant shall notify the certifying body if the FHP changes.

Further clarification to this standard is required; standard should set out what diseases or pests require such coordination. Coordination is a broad term requiring further definition.

BAP: *More detail is now included in the Implementation Guidelines regarding sea lice:*
“Applicants must be able to demonstrate that AMA rules and sea lice management procedures have been written for the protection of wild salmon, as well as the farmed fish, and that they include monitoring of sea lice loads and the setting of treatment trigger thresholds that take into account key factors such as season, the life cycle stages of farmed and wild fish, and the specific characteristics of the area in question.”

10.8: If used, drug treatments shall be based on recommendations and authorizations overseen by the fish health professional, who shall be guided by the FHMP and principles of best practice for his or her profession (Standard 11) and prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations.

Suggested amendment to read: If used, … to treat diagnosed diseases in accordance with national regulations. (Deleting in accordance with instructions on product labels.)

Rationale: In Canada, there are very few products that have been designated specifically for use in aquaculture; however, there are products licensed for use which can be effective in treating fish health issues, and these products are allowed to be used “off label.” Stipulating “in accordance with instructions on product labels” would disallow their use under this standard.

11.1: Antibiotics or chemicals banned in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish.

Suggested amendment to read: Antibiotics or chemicals banned in the producing country shall not be used in feeds or any treatment.

Suggest creation of another standard that speaks to the requirement that no product shall be exported if it contains harmful residue of antibiotics or chemicals.

Rationale: The original standard combines two issues: the use of banned products in producing fish and the potential for the presence of harmful antibiotic or chemical residues in fish at time of export. Just because an importing country may not license an antibiotic or chemical does not mean it is banned, and seldom do countries have a list of banned products. The presence or absence of licensing should be not confused with approval or not of that product.

BAP: *The BAP program includes a mandatory processing standard that controls the risk of harmful residues in finished products.*

FishWise

Oscar Zelaya, Ph.D.
Santa Cruz, California, USA

At FishWise, a nonprofit sustainable seafood consultancy, we believe it is of critical importance to define and implement standards that set a high performance bar that will lead to greater sustainability for salmon farming. Salmon is one of the most important seafood products, in terms of value and volume, for many of our business clients, and sometimes accounts for the majority of their sales. We are aware of the prevailing demand for salmon on the seafood market as well as the limited number of producers operating with sustainable practices. Our clients are actively seeking new sources of farmed salmon with fewer environmental impacts. It is our hope that these standards may be strengthened to the extent that the resulting products meet the purchasing policies of our clients.

We want to ensure that evolving certification schemes are set at a high level and are as rigorous as possible in addressing key impacts. Our comments take into account that the salmon industry has been operating at a large commercial scale for over 30 years, a period long enough to provide clear evidence of the various consequences of inappropriate and unsustainable management practices.

During this time, the use of free ecological services has been capitalized on, allowing for secure financial strength, which could support internalizing the cost of these services and reducing environmental impacts.

Our comments also consider a comparison between the BAP salmon standards and the Salmon Aquaculture Dialogue's draft standards for responsible salmon aquaculture. We have made this additional effort in order to be in a better position to explain to our clients the differences, similarities, strengths and weaknesses. Because our clients have established rigorous sustainable seafood purchasing policies, we hope that the BAP standards will meet or, ideally, exceed those being established in the Salmon Aquaculture Dialogue.

General comments
Understanding that the Allowable Zone of Effect (AZE) is an area in which a regulatory body will allow some alteration of the relevant environmental quality standard or some limited damage to the environment, and that an AZE plays a critical role in determining cumulative effects and assessing environmental impacts, we consider it essential to specifically define the AZE in terms of its coverage. Additionally, indicators should be included to assess impacts within and outside the AZE.

BAP: *We have expanded the explanation of why we think it best to rely on local standards presently. However, where there are none, we have now defined the coverage and explained the analytical methods of choice.*

Given the typical industry growth from few to many farm operations in most regions in the world, it is important to regulate at both the individual and collective level. Currently, it is possible for a farm following sustainable practices to contribute to negative environmental impacts, given the management practices of other operations in the area.

Therefore, standards should require a fully developed and implemented area-based management plan that regulates collective management actions related to production level, application/rotation of treatment and environmental impact monitoring programs, among others.

BAP: *Agreed. The standards include provisions for individual farms as well as Area Management Agreements.*

Moving from the general to the specific, we believe there is a need to set measureable limits for aspects such as maximum mortality rate of farmed fish during consecutive cycles, unexplained mortalities, escapes (defined in terms of absolute numbers and not on a percentage basis) and others, indicated subsequently.

BAP: *The escapes standard has been modified accordingly, defining limits in fish numbers rather than percentages. Also, the standard sets a fish in:fish out ratio limit (2.0 falling to 1.5 in 2016) which can't be attained without consistently good survival rates.*

Specific comments
Legal Compliance, Continuous Improvement
Text to change: For these reasons, the BAP standards strive to be consistent with the best international practices and, in doing so, seek to affect the industry as a whole in a process of continuous improvement. In no instance are facilities required to adopt practices contrary to the rules under which they presently operate, but in some cases may be required to do more.

Proposed text: For these reasons, the BAP standards strive to be consistent with the best international practices according to _____ or as defined by _____and, in doing so, seek to affect the industry as a whole in a process of continuous improvement. In no instance are facilities required to adopt practices contrary to the rules under which they presently operate, but in some cases may be required to do more.

Reason for change: It is necessary to specify what is meant by best international practices. Defined by whom? The way this is written leaves it open to different interpretations.

BAP: *Agreed. The above wording is ambiguous. The introduction to the standard now explains:*
Legal Compliance, Continuous Improvement
BAP standards demand compliance with local regulations as the first step toward certification. However, not all regulations are equally rigorous. For this reason, BAP standards set out requirements for documentation and procedures that must be in farm management plans whether they are already prescribed by local regulations or not. By so doing, they seek, where possible, to impose consistency in performance between facilities in different producing regions and to engage the industry as a whole in a process of continuous improvement.

Text to change: In parallel with the implementation of these standards for salmon farms, the Global Aquaculture Alliance will establish a BAP database to provide a knowledge base for the continuous improvement that is implicit in the BAP concept. The database will allow salmon farmers, and eventually farmers of other species, to submit data anonymously on certain aspects of their operations for which evaluation by scientists might lead to better future standards. The data that will or may be required once this database is established are noted in the individual standards that follow.

Proposed text: In parallel with the implementation of these standards for salmon farms, the Global Aquaculture Alliance will establish a BAP database to provide a knowledge base for the continuous improvement that is implicit in the BAP concept. The database will allow salmon farmers, and eventually farmers of other species, to periodically submit data on specific aspects of their operations and area of operation for which evaluation by scientists might lead to better future standards. The data that will or may be required once this database is established are noted in the individual standards that follow.

Reason for change: Data submitted anonymously would be of limited use. To make the data analysis effective, it will be necessary to know where it comes from to fully understand how operations are interacting with the environment. To ensure continuous improvement, these data submissions should be conducted regularly. This will allow for analysis that correlates adopted measures (or lack of them) with environmental effects.

BAP: *As this is a voluntary program, it is difficult to require farms to supply data openly if they don't wish to. A guarantee of anonymity seems reasonable and is consistent with other certification programs. Anonymous data may be of less use, but they can still be very valuable when data requirements are carefully specified. A corresponding problem with publicly attributed data is that they can be misused, thereby detracting from the purpose of collecting them in the first place. Anonymity is therefore an appropriate compromise, and it is better than not collecting anything.*

2. Community Relations
Text to change: 2.1: The applicant shall accommodate local residents by not unnecessarily blocking access to fishing areas and other public resources.

Proposed text: 2.1: The applicant shall accommodate local residents by not blocking access to fishing areas and other public resources.

Reason for change: There is no reason or justification to block access to fishing areas. If it is necessary to do so, then either the farm or operation is located in the wrong place or some joint effort with the community should take place to facilitate access.

BAP: *The clause has now been reworded to provide more clarity:*
2.1: The applicant must demonstrate that the farm does not prevent access to fishing areas and other public resources. Where access is not direct, the applicant must provide signage and a written access plan demonstrating consideration of biosecurity, employee and public safety.

4. Environment Sediment and Water Quality
Text to change: The permits also usually prescribe monitoring protocols to determine a farm's impact on a site in terms of changes in the bottom sediments inside and outside a prescribed "allowable zone of effect."

Proposed text: The permits also usually prescribe monitoring protocols to determine a farm's impact on a site in terms of changes in the bottom sediments inside and outside an "allowable zone of effect" defined as an area at least 30 to 150 meters (or another range considered appropriate according to the best available scientific criteria) from the farm location.

Reason for change: Understanding that the allowable zone of effect (AZE) is an area in which a regulatory body will allow some alteration of the relevant environmental quality standard or some limited damage to the environment, and that an AZE plays a critical role in determining cumulative effects and assessing environmental impacts, we consider it essential to specifically define the AZE in terms of its coverage, given hydrographic, benthic and other environmental conditions. Additionally, indicators should be included to assess impacts outside the AZE.

BAP: *As mentioned above, we have expanded the explanation of why we think it best to rely on local standards presently. However, where there are none, we have now defined the coverage and explained the analytical methods of choice.*

Further details are now included in the Implementation Guidelines:
"In countries or regions, where sediment monitoring is not required as described above and/or where an allowed sediment impact zone is not defined; applicants shall write and implement a monitoring plan, which shall require them to:

- *Chart an allowable sediment impact zone that shall not exceed the total area of the farm plus a boundary zone of 40 meters around it for contiguous (steel) cages and 25 meters for circular cages that are set out individually. The footprint may be shifted in any direction to account for normally occurring uneven current patterns, as long as the total area remains the same. "*

The Implementation Guidelines also specify:
"Since different methods or combinations of methods may be required by different jurisdictions, based on local hydrographic or benthic conditions, no preferred method is specified in this standard, only that whatever method is used shall be undertaken using standard methods of sampling and analysis that conform to generally accepted international standards.
(Note: It is expected that an ISO standard for "Environmental monitoring of the seabed impacts from marine finfish farms," [ISO/TC 234/SC N 85 - ISO/CD 12878] will be finalized within two years, when it may be appropriate to require its protocols for this BAP standard. This will be kept under review by GAA, and the above requirements shall apply in the meantime).

Note also that the BAP approach to sediment quality has been influenced by the comments from Dr. Jack Rensel (above) and does not at this stage include specific metrics beyond those required locally in permits.

4. Environment
Sediment and Water Quality
Text to change: 4.1: The applicant shall provide an independently reviewed baseline study that shows hydrographic and benthic conditions at the farm site can meet or exceed specified values in operating permits at current production levels. Optionally, the applicant may provide three years of monitoring data to show that the farm meets these standards.

Proposed text: 4.1: The applicant shall provide an independently reviewed baseline study that shows hydrographic and benthic conditions at the farm site can meet or exceed specified values in operating permits at current production levels. The applicant must provide three years (or more) of monitoring data to show that the farm meets these standards.

Reason for change: Rigorous and demanding standards are necessary to drive significant change within the industry. Collecting data related to environmental variables has become more common for most salmon-farming regions, so the standard should be strengthened to ensure that this data collection continues and is improved upon. In addition, it is necessary to specify the variables that should be monitored and the frequency of monitoring.

BAP: *All established farms are now required to give three years of data, and there is a separate clause for newly established farms:*
4.2 For established farms, the applicant shall provide three years of monitoring data to show that the farm meets or exceeds sediment and water quality criteria specified in its operating permits and/or in its own monitoring plan at current operating levels.
4.3 For newly established farms, or farms that have expanded and do not yet have enough monitoring data, the applicant shall provide an independent study that characterizes the hydrographic and benthic characteristics of the area and provides a consultant's opinion (without liability) that the farm can meet or exceed sediment and water quality criteria if operated correctly. This opinion shall be verified by reference to sampling results at the next audit.

Text to change: 4.2: Monitoring for organic accumulation and biological diversity in sediments immediately beneath the farm and at prescribed distances from it shall be undertaken at the time of peak feeding during the production cycle and following a fallow period between cycles.

Proposed text: 4.2: Monitoring for organic accumulation and biological diversity in sediments immediately beneath the farm and at prescribed locations within the AZE (by now well-defined based on hydrographic, benthic conditions and other environmental aspects) from it shall be undertaken at the time of peak feeding during the production cycle and following a fallow period between cycles.

Reason for change: Understanding that the allowable zone of effect (AZE) is an area in which a regulatory body will allow some alteration of the relevant environmental quality standard or some limited damage to the environment, and that an AZE plays a critical role in determining cumulative effects and assessing environmental impacts, we consider it essential to specifically define the AZE in terms of its coverage, given hydrographic, benthic and other environmental conditions. Additionally, indicators should be included to assess mpacts outside the AZE.

BAP: *Note that the BAP approach to sediment quality has been influenced by the comments from Dr. ack Rensel (above) and does not at this stage include specific metrics beyond those required locally in permits. The relevant clause now reads:*
4.4: Monitoring of sediment conditions shall be undertaken at the time of peak feeding during the production cycle and shall be conducted according to requirements of the farm's operating permits, or according to its own plan in countries or regions where sediment monitoring is not required and as specified in the implementation requirements.

The Implementation Guidelines also state "In countries or regions where sediment monitoring is not required as described above and/or where an allowed sediment impact zone is not defined; applicants shall write and implement a monitoring plan, which shall require them to. Therefore, if no AZE is required by local standards, the BAP defines one.

Text to change: 4.5: Data that will enable the farm's feed-based carbon and nitrogen discharge to be calculated shall be collected, recorded and uploaded to the BAP database, when available.

Proposed text: 4.5: Data that will enable the farm's feed-based carbon and nitrogen discharge to be calculated shall be collected, recorded and uploaded to the BAP database and be available for public access.

Reason for change: Rigorous and demanding standards are necessary to drive significant change within the industry. Collecting data related to environmental variables has become more common for most salmon farming regions, so the standard should be strengthened to ensure that this data collection continues and is improved upon. In addition, it is necessary to specify the frequency for uploading data.

BAP: *The BAP program is committed to continual improvement, but the database is not intended for public access (details or reports generated in the auditing process are also confidential unless the applicant chooses otherwise). The key piece of information available to the public will be whether a particular farm is currently certified to the BAP standard or not. This is consistent with existing certification programs. All the same, Section 2 does require a positive approach to information sharing:*
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.

Text to change: 4.6: If the farm is within an established Area Management Agreement, production cycles, fallowing and nutrient monitoring shall be coordinated with the other BAP-certified farms or applicants, and results shall be uploaded to the BAP database, when available.

Proposed text: 4.6: The farm should be part of an established Area Management Agreement (or developing its own if no other existed previously), and production cycles, fallowing and nutrient monitoring shall be coordinated with the other BAP-certified farms or applicants. Results shall be uploaded to the BAP database and be available for public access.

Reason for change: Farms should either be part of an existing area management agreement or developing its own (if no other previously existed).

Rigorous and demanding standards are necessary to drive significant change within the industry. Collecting data related to environmental variables has become more common for most salmon-farming regions, so the standard should be strengthened to ensure that this data collection continues and is improved upon. In addition, it is necessary to specify the frequency for uploading data.

BAP: *Agreed. The relevant clauses are now within Standard 2:*
2.6: The applicant shall be a participant in or be working towards participation in an Area Management Agreement, as described in the implementation requirements, and shall be able to demonstrate compliance with the terms of such an agreement or to demonstrate compliance with a projected timeline for establishment of such an agreement.
2.7: Where an AMA has not yet been established, applicants must nevertheless be able to demonstrate that they cooperate on matters of stocking, fallowing, fish health and biosecurity (See Sections 4 and 10) with BAP-certified farms within an area twice the regulatory minimum separation distance to an upper limit of a 5-kilometer radius.

5. Environment
Fishmeal and Fish Oil Conservation
Text to change: 5.2: Records that document the traceability to source of marine protein and lipid ingredients present in feed at levels of 1% and non-marine ingredients at levels of 10% or greater shall be available.

Proposed text: 5.2: Records that document the traceability to source sustainable marine protein and lipid ingredients present in feed at levels of 1% and non-marine ingredients at levels of 10% or greater shall be available.

Reason for change: The standards, beyond referring the inclusion factor and traceability of marine protein and lipid ingredients, must specifically require that they derive from sustainable sources. Down to simple terms, traceability implies being able to get to the original source, and with that, legal/regulatory considerations may play a role.

But what if the resource/ or species being considered is not regulated at a global scale? Or even if global regulations and/or limits (quotas for instance) are in place, they might not necessarily be adequate ones (over- or underestimation, miscalculation due to variables not considered in a model, etc). In such conditions, it is possible to be traceable but not necessarily sustainable (this either intentionally or unintentionally). For this reason, this standard should require traceability, but needs to be complemented by requiring that the traceable sources prove (or seek to prove) to be under sustainable management too.

BAP: *By reference to the BAP feed mill standards, the standard includes provisions on the sustainable sourcing of fishmeal and fish oil for feed, such that by 2015, a minimum of 50% of oil and meal shall be obtained from certified sources.*

Text to change: 5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 2.5 or less for the most recent year class harvested

Proposed text: 5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested. If a ratio of 1.5 is not achieved, records from the past three years should show a trend of improvement.

Reason for change: Fishmeal and fish oil are largely made from small pelagic fisheries such as anchovies, menhaden and sardines. These and other pelagic fish provide important ecosystem benefits to the marine environment. Unfortunately, their fishery landings have either remained constant or declined over the last decade, something that indicates mismanagement or overexploitation. In addition, the percentage utilized by aquaculture has risen, currently accounting for 60 to 70 percent of the annual production of fishmeal and 80 to 90 percent of the annual production of fish oil.

Evidently aquaculture will continue to grow. Therefore, it is necessary to establish standards that pressure the industry towards substantial improvement. In addition, we suggest dividing FIFO into two components, one addressing fishmeal and the other fish oil. This would facilitate determining from where inefficiencies derive as well as addressing them with proper specific measures.

BAP: *Agreed. In response to your and other arguments, the FIFO limit has been reduced to 2.0 with a target of 1.5 for 2016. The FIFO calculation method is the one applied by the International Fishmeal and Fish Oil Organisation (IFFO), and it has the advantage of generating a single number. The alternative method, applied by WWF's Aquaculture Dialogues, calculates a pair of ratios for dependency on marine oil and marine meal.*

For the Salmon Aquaculture Dialogue, the proposed limits for these ratios are 2.85 (oil) and 1.31 (meal). These limits equate to an FIFO of 1.6 using the IFFO method. Referring to a single FIFO ratio is considered to be much less confusing for non-specialists. Even within industry and interested NGOs, there is already plenty of confusion about the distinction between FCR and FIFO.

6. Environment
Control of Escapes
Text to change: 6.3: The margin for error in the inventory counts for the last year class of fish for which harvesting has been completed shall be within ± 2% after allowance for the margin of error in the count from the hatchery.

Proposed text: 6.3: The margin for error in the inventory counts for the last year class of fish for which harvesting has been completed shall be within ± 2% after allowance for the margin of error in the count from the hatchery (which should not be greater than 5%).

BAP: *We have not yet put a limit on this, only requiring that it be stated on delivery and supported by documentation as follows:*
"The margin of error shall be verifiable by reference to documented hatchery procedures and records."

Setting of a specific limit awaits development of a hatchery standard, which is a GAA priority.

Reason for change: There is a need to set a limit on the hatchery count error, e.g., should not exceed 5%. This implies allowing for an overall error of 7%, still high when average stocking densities commonly used by the industry are considered.

BAP: *Agreed. The inventory standard now specifies:*
6.6: The applicant shall provide documents to show that the variance between the projected and actual harvest numbers of fish from the last year class harvested was less than ± 3% after accounting for known losses.
And the inventory accounting procedures require:

- *A certificate, signed by an authorized hatchery representative, shall accompany all shipments of juvenile fish (smolts) received that states how many fish there are in the shipment and the estimated margin of error in the count. The margin of error shall be verifiable by reference to documented hatchery procedures and records.*
- *A projection shall be prepared immediately after a year class of smolts is fully stocked of the number of fish expected to be harvested in each year class, based on the number of smolts received and taking into account the possible error in the hatchery count, as well as other projected losses during the growth cycle.*
- *The above projection shall then be compared with the actual number harvested when harvesting of a year class is complete. Any variance shall be explained by reference to farm records of known losses. Variances greater than ± 3% that cannot be explained shall prompt a secondary audit investigation at the applicant's expense to try to determine the cause and, if a satisfactory explanation is not found, shall result in loss of BAP certification.*

Text to change: 6.5: The applicant shall demonstrate, by reference to detailed stock records, that there has been no single escape event of 10% or more of the farm's total inventory.

Proposed text: 6.5: The applicant shall demonstrate, by reference to detailed stock records, that there has been no single escape event of more than 200 fish of the farm's total inventory.

Reason for change: The standard should be specified as a number. Percentages can be misleading, e.g., 10% of 200,000 fish from a pen means 20,000 fish, which is too large to be considered acceptable.

BAP: *Agreed. The escapes standard is now specified in numbers rather than percentages, with the requirements as follows:*

- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*
- *In both cases, reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review and risk assessment to determine the cause or causes of escapes, and to recommend corrective action where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken.*

7. Environment
Predator and Wildlife Interactions
Text to change: 7.1: The applicant shall have a written Wildlife Interaction Plan that meets the BAP requirements for training, procedures, records, risk assessment (if needed) and reporting outlined in the guidelines.

Proposed text: 7.1: The applicant shall have a written Wildlife Interaction Plan (developed with the participation of scientific groups, NGOs and the community) that meets the BAP requirements for training, procedures, records, risk assessment (if needed) and reporting outlined in the guidelines.

Reason for change: This will help to ensure that the Wildlife Interaction Plan considers the various perspectives of the main stakeholders.

BAP: *The stated requirements of the Wildlife Interaction Plan are designed to address stakeholder concerns for wildlife protection. If they don't, then the provisions of Section 2 would come into play:*
2.3: The applicant shall demonstrate interaction with the local community to avoid or resolve conflicts through meetings, committees, correspondence, service projects or other activities, with meetings conducted annually or more often.
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.

Text to change: 7.6: The applicant shall provide site maps or other documentation that show the farm is not within an area designated as "critical" or "sensitive" habitat (or equivalent).

Proposed text: 7.6: The applicant shall provide proof of an ongoing monitoring program, site maps and/or other documentation that shows the farm is not within an area designated as "critical" or "sensitive" habitat (or equivalent).

Reason for change: Due to possible changes in wildlife migratory patterns or living sites, it is important to constantly monitor the area and keep records to show that it has not become critical or sensitive.

BAP: *Agreed. New wording in the Implementation Guidelines now requires:*
"a map that identifies officially designated 'critical' and/or 'sensitive' marine and coastal habitat in the region. If the farm is in an area so designated, a list of the classified or endangered sedentary species within a 2-kilometer radius of the farm and of mobile coastal species within the region shall also be included, updated where necessary to show wildlife populations established after the farm was started."

9. Animal Health and Welfare
Health and Welfare

Text to change: 9.3: The applicant shall apply stocking density criteria based on local conditions, which shall normally be at or below an average 25 kg/m^3 but may rise higher than this for 5% of the production cycle if the fish show other good welfare indicators.

Proposed text: 9.3: The applicant shall apply stocking density criteria based on local conditions, which shall normally be at or below an average 25 kg/m^3 but may rise higher than this for 5% of the production cycle if the fish show good welfare indicators and various environmental considerations are considered healthy.

Reason for change: Higher densities should not be justified solely on fish conditions. Relevant environmental indicators could relate to water quality, bottom soil and benthic conditions.

BAP: *Agreed. The BAP standards on sediment and water quality specifically require measurements during periods of peak feeding (which will typically cover the periods of peak biomass). Peak feeding was chosen rather than peak biomass as the point of greater environmental risk.*

10. Animal Health and Welfare
Biosecurity and Disease Management
Text to change: 10.10: The applicant shall record data on disease outbreaks and actions taken so this information can be made available to the BAP database, when it is established.

Proposed text: 10.10: The applicant shall record data on disease outbreaks and actions taken so this information can be made available to the public and to the BAP database, when it is established.

Reason for change: Relevant and critical data should be made public to ensure transparency and to facilitate scientific analysis from different interested parties.

BAP: *The BAP database is not intended for public access (details or reports generated in the auditing process are also confidential unless the applicant chooses otherwise). The key piece of information available to the public will be whether a particular farm is currently certified to the BAP standard or not. This is consistent with existing certification programs. All the same, Section 2 does require a positive approach to information sharing:*

2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.

Text to change: 10.11: The applicant shall have or be working toward the establishment and implementation of an Area Management Agreement that incorporates coordinated production and fallowing cycles, sea lice treatments, data sharing and, where considered necessary, nutrient monitoring.

Proposed text: 10.11: The applicant must have established and implemented an Area Management Agreement that incorporates coordinated production and fallowing cycles, sea lice treatments, data sharing and, where considered necessary, nutrient monitoring.

Reason for change: It is necessary to ensure that prior to gaining certification, farms have a well-defined area management agreement. Leaving the standard as it is would allow continued operation, without any timeframe to fully comply with the requirement.

BAP: *BAP-certified farms have to demonstrate their commitment to area management. The text in the Implementation Guidelines specifies:*
"The BAP program also encourages the creation of AMAs where they do not exist and their improvement when their boundaries are not based on hydrographic characteristics. However, because the ability to coordinate management between farms is not under the control of a single BAP applicant, the creation of, and/or setting boundaries for an AMA is not a requirement for initial BAP certification in this version of the standard.

Nonetheless, these applicants must demonstrate their concerted effort to cooperate with other relevant parties, including regulatory agencies, to define or improve a management area and to coordinate management activities among farms within it. Such efforts can include, for example, mapping of the hydrographic zone of influence of the BAP applicant farm and submission of this data to the other relevant parties.

Further, BAP applicants in this position must project a timeline for implementation of an AMA and report against this at audit and, if the timeline is not met, provide documentary evidence to show why failure was beyond their control."

The clauses in Standard 2 specify:
2.6: The applicant shall be a participant in or be working toward participation in an Area Management Agreement as described in the implementation requirements and shall be able to demonstrate compliance with the terms of such an agreement or to demonstrate compliance with a projected timeline for establishment of such an agreement.
2.7: Where an AMA has not yet been established, applicants must nevertheless be able to demonstrate that they cooperate on matters of stocking, fallowing, fish health and biosecurity (See Sections 4 and 10) with BAP-certified farms within an area twice the regulatory minimum separation distance to an upper limit of a 5-kilometer radius.

Watershed Watch Salmon Society

Stan L. Proboszcz
Coquitlam, British Columbia, Canada

Dear Members of the GAA Salmon Technical Committee and the Standards Oversight Committee:

Watershed Watch Salmon Society is a charity organization with a mission to protect and restore B.C.'s precious wild salmon. Through scientific expertise, strategic alliances, outreach programs, and innovative projects, our organization is at the forefront in sounding the alarm on threats to salmon, and in prompting action to help them.

We appreciate this opportunity to comment on the GAA draft standards. Watershed Watch has been working with the aquaculture industry in B.C. for a number of years towards finding solutions to the impacts of salmon aquaculture.

We included detailed comments on the specific standards below. Firstly, we would like to highlight the stated objectives of the GAA salmon standards to "specifically address environmental and social responsibility" and "promote[s] environmentally responsible use of land, water, nutrients and other resources for aquaculture production," are not upheld by the requirements outlined in the standards at this time.

While the narrative sections of the standards at times discuss broader goals and improvements in practices, the standard requirements themselves primarily rely on farmed salmon producers to meet local regulations. This is insufficient for meeting the objective of environmental and social responsibility.

There is a large body of research demonstrating that net pen salmon farms are negatively impacting wild fish and marine ecosystems, even with existing regulatory requirements (Krkosek and Hilborn 2011; Connors et al. 2010; Obee 2009; Ford and Myers 2008; Sutherland et al. 2007; Jamieson and Olesiuk 2001; Hargrave et al. 1993). In addition, there are significant differences in the stringency of regulations, data transparency, and environmental and social impacts in the major farmed salmon-producing regions of the world (Porter 2006). The preamble acknowledges this, but the standard themselves still rely on local regulations rather than setting improved performance standards by articulating "the best international laws" as the introduction states the standards will do.

Depending upon current regulations to manage the impacts of salmon aquaculture is not sufficient to encourage continuous improvement and is not sufficient to market a product as "environmentally and socially responsible." We recommend below a number of areas where the standards can be strengthened and encourage the technical and oversight committees to incorporate these recommendations in the next draft. We also strongly recommend that the GAA hold a second period of public comment after the next revision in order to ensure recommendations are adequately considered and incorporated.

Producing global standards for salmon aquaculture is not an easy task, and there is much knowledge and research from stakeholders that needs to be considered at the outset in order to meet the GAA's stated goals. Further to this, all public comment needs to be posted in a publicly accessible manner, such as the GAA website, and a response to the concerns raised needs to be posted by the committees to increase the transparency of the standards development process and ensure public comment is being considered.

BAP: *The preamble to the standards has been modified to better reflect the aims and scope of the BAP program. In key areas, the standards go far beyond existing regulations, and this justifies the social and environmental claims of the program.*

The most far-reaching impact of salmon farming is commonly identified as its impact on wild fisheries through its use of fishmeal and fish oil in compounded feeds. There are no laws that address this impact, but the BAP salmon standards have requirements for sustainable sourcing of these ingredients and for their efficient usage, with a requirement for the fish in:fish out ratio of 1.5:1 in five years. To deal with more localized impacts, farms are required to create or to participate in area management agreements to control pests such as sea lice. Also, there are provisions on containment and escapes to reduce the risks of impacts on wild salmon populations.

Comments on Specific Standards
Community Relations
The community relations section of the standards does not adequately address community use conflicts that are occurring in major salmon-farming regions.

Standard 2.1 states: The applicant shall accommodate local residents by not unnecessarily blocking access to fishing areas and other public resources. This leaves "unnecessarily blocking" open to interpretation and fails to address user conflicts that arise when aquaculture reduces the viability of local marine resources.

The 1990 R. v. Sparrow decision by the Supreme Court of Canada ruled that aboriginal harvests of fish for food, social and ceremonial purposes have a priority in resource allocation (Supreme Court of Canada 1990). Many First Nations groups affected by the operation of net pen salmon farms in their traditional territories have raised concerns about mercury contamination originating from salmon farms, the impact of untreated waste and chemicals on clam beaches, shrimp and prawns, and the decline of wild salmon due to the transfer of sea lice and disease between farmed and wild salmon (DeBruyn 2006).

In 2009, First Nations in the Broughton Archipelago launched a class-action lawsuit against the B.C. government for damages caused by salmon farming to wild salmon stocks, a traditional food source. The B.C. Supreme Court class-action suit involves eight First Nations in the area, which are seeking:

- A declaration that the way the province has authorized and regulated salmon farms has contributed to a significant decline in the wild salmon stocks and infringed on natives' constitutional fishing rights.

- An injunction prohibiting the issuing of salmon aquaculture permits in the Broughton Archipelago pending adequate consultation and accommodation with natives, and
- A declaration that the province must remediate the impact of salmon farms on wild salmon.

Salmon farms in the region where legal action is being pursued could technically meet the standard.

BAP: *The standards have been modified to:*
2.1: The applicant must demonstrate that the farm does not prevent access to fishing areas and other public resources. Where access is not direct, the applicant must provide signage and a written access plan demonstrating consideration of biosecurity, employee and public safety.

2.1: Without meeting the intent of the Community Relations section. When local communities need to resort to legal action to protect access to traditional food sources, which fortunately for Aboriginal people in Canada they have legal rights to do, it is difficult to argue the product is being produced in a socially responsible manner.

However, GAA certification will market certified products as socially responsible to buyers and consumers. The Community Relations section needs to adequately address impacts on resources used by indigenous groups and the operation of aquaculture sites in traditional territories before being able to legitimately claim social responsibility.

BAP: *The Community Relations provisions are indeed designed to address impacts on resources used by indigenous groups. In addition to 2.1 above regarding access rights, the standards also specify:*
2.3: The applicant shall demonstrate interaction with the local community to avoid or resolve conflicts through meetings, committees, correspondence, service projects or other activities, with meetings conducted annually or more often.
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.
2.5 Where applicable, the applicant must demonstrate dialogue with local native peoples and a process for conflict resolution with them under the laws governing their rights.

Standard 2.4 states: The applicant shall record, review and respond to reasonable complaints and requests for information received from the public. This standard lacks the necessary rigor to make it effective and meaningful. “Reasonable” requires a definition, and there needs to be binding language that requires the data relevant for understanding local impacts, such as disease, sea lice, and antibiotic and parasisticide treatments, to be made available upon request.

The current standard simply implies a response is required to requests for information, and a response can of course be negative. Hence, as currently written, it does not mandate any meaningful intention to share information. The best international practices provide quick public access to this type of information at no charge. There have also been a number of rulings from regulatory and governmental bodies requiring companies to provide these data to stakeholders and public inquiry processes.

BAP: *2.4 has been modified:*
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.

Sediment and Water Quality
The Sediment and Water Quality section begins with the goal of each farm being "located and operated in such a way that they do not have significant negative impacts on sediment quality... or water quality." However, the standards themselves rely exclusively on the requirements set in local operating permits.

There are no standards that require best international practices to be met or continuous improvement over time. While monitoring is required, with a mention of the eventual creation of a BAP database, no actions need to be taken based on these results other than following local regulations. For a standard purporting to promote environmentally responsible practice, this fails to set a common threshold of performance for all BAP-certified salmon farms and does not achieve the stated goal of having no significant negative impacts.

BAP: *There are good reasons to avoid the temptation (at this stage) to create a global, metrics-based standard for sediment quality that can be usefully applied in the 12 countries where salmon are farmed. This view has been expressed by, among others, Dr Jack Rensell in his public comments.*

The salmon technical committee favors the route of gathering information through the BAP database before presuming that it can improve on locally designed monitoring programs. All the same, the BAP requirements for sediment quality monitoring are clearly laid out and they have significant implications for areas with or without existing regulations.

Standard 4 also says: (Note: It is expected that an ISO standard for "Environmental monitoring of the seabed impacts from marine finfish farms," [ISO/TC 234/SC N 85 - ISO/CD 12878] will be finalized within two years when it may be appropriate to require its protocols for this BAP standard. This will be kept under review by GAA and the above requirements shall apply in the meantime.

Fishmeal and Fish Oil Conservation
The section on fishmeal and fish oil conservation opens with a statement that discounts the importance of small fish to human consumption. Forage fish have been, and still are, consumed by humans. Leading researchers have documented the technological advances in processing and a number of consumer campaigns in the developing world that are increasing the direct human consumption of forage fish. Consumption increases are most marked in the developing world, where traditional stocks are depleted and other sources of protein are too expensive or difficult to buy (Alder and Pauly 2006).

The role of forage fish fisheries for economic wellbeing and food security along the coasts of Chile and Peru has increased since the 1970s (ibid). Globally, pelagic fish are an incredibly important component of human diets; pelagic fish contribute more than 50% of total fish supply in more than 36 countries (Tacon and Metian 2009). Small pelagic fish are particularly important in developing countries, where malnutrition remains the leading cause of death.

Food fish are a major source of animal protein for about half of the Sub-Saharan Africa population, an area home to 206 million undernourished people (24% of the world total). Some of the marine small pelagic fish consumed in Sub-Saharan countries is locally caught. However, imported lower-cost species such as mackerels, herrings, pilchards/sardines and anchovies are an important part of their diet. The Sub-Saharan region is the only region of the world where per-capita consumption of fish has fallen, and aquaculture only accounts for 3% of fish consumed.

For a standard that intends to promote environmentally and socially responsible practices, the impact of feed ingredients must be more seriously addressed to reduce the dependence on wild fish and create incentives for continuous improvement over time. The standards as currently written are weak in terms of definitions — "sustainable fisheries" is not defined in the preamble and is not required in the standards. The implementation time of three years to meet the feed mill standards is too long, and the traceability requirements are too low.

The calculation for the fish in:fish out ratio allows fishery and aquaculture by-products to be excluded, which makes the allowance of 2.5 fish in to fish a very low bar. Much better fish in:fish out ratios are already being attained by industry, and the GAA standard should reflect best practices to meet its stated goals. In addition, a standard needs to be included that creates an incentive for continuous improvement of the fish in:fish out ratio over time.

BAP: *The importance of fishmeal and fish oil conservation is fully understood. Hence the standard now includes provisions on sustainable sourcing and requires a tighter fish in:fish out ratio limit (2.0) that falls over time to 1.5 in 2016.*

Control of Escapes
The procedural, performance, documentation and reporting requirements for escape prevention require the same types of measures commonly contained in local regulations. These requirements for prevention and recovery plans in the event of an escape have proven insufficient to prevent escapes or to recapture a significant portion of the fish when escapes occur.

Despite new guidelines for net strength and pen system anchoring in Canada, B.C. MAL reported more than 100,000 escaped farmed salmon in 2008, more than the previous six years combined. In 2009, escapes of 72,000 Atlantic salmon were reported. In a typical incident in 2009, over 40,000 Atlantic salmon escaped, and only 1,200, or 3%, were recovered.

On a site basis, standard 6.4 is a very weak requirement: The applicant shall demonstrate by reference to detailed stock records that there have not been three or more escape events of 0.5% or more of the farm's total inventory during the last two production cycles.

Given the significant impacts of escaped farmed salmon on wild populations as noted in the narrative of this section, a lower threshold for permitted escapes is necessary to meet the objectives of environmental responsibility. This is particularly true in areas where native salmon stocks have declined.

When the escaped fish are the same species as wild salmon in the area, the large amount of net pen escapes relative to the small number of local wild salmon put wild stocks at high risk of genetic disruption through interbreeding (Morris et al. 2008). Even comparatively small differences in genetic traits can result in changes that affect traits closely related to the ability of a population to maintain or increase its numbers in succeeding generations. The result of this genetic disruption is lower rates of survival of populations over time (Darwish and Hutchings 2009).

While it is commendable that certification would be revoked if standard 6.4 is breached, the inclusion of the statement that corrective action is required "when these are matters that the applicant can reasonably be expected to control," provides a loophole for escapes caused by major weather events and the like. While the company cannot control the weather, farms need to be designed to withstand major weather events, especially as major storms increase in frequency and intensity.

BAP: *The standard on escapes has been rewritten to replace percentage limits with numerical values, making it stricter. The Implementation Guidelines now specify:*

- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*

In both cases, reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review and risk assessment to determine the cause or causes of escapes, and to recommend corrective action where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken.

Standard 6.5
The applicant shall demonstrate by reference to detailed stock records that there has been no single escape event of 10% or more of the farm's total inventory — sounds very stringent, however, the ability for farms to recertify after an inspection means this standard would be more accurately written as, "there has been no single escape event of 10% or more of the farm's total inventory. When an escape over this magnitude occurs, reinstatement of BAP certification shall be subject to an independent engineering and operational review," as this is what the narrative allows.

Standard 6.6 could potentially offer significant protection of wild salmon from the impacts of escaped fish. However, the lack of definition for how and by whom "critical" or "sensitive" habitats for wild salmon are to be designated negates this potential.

Many habitat protection designations for wild salmon are limited to their freshwater spawning habitats because their marine migrations are broad, and specific routes are sometimes unknown. Therefore, this standard will not have many useful applications. In ocean areas where salmon farming occurs, it would be more effective to require wild salmon migratory areas to be avoided than depend on habitat designations that have not yet been applied to the marine portion of wild salmon's life cycles.

BAP: *It is true that marine salmon migrations are broad, and specific routes are sometimes unknown. This is a key factor driving the need for standards that limit escapes and potential sea lice impacts. However, this has not been determined to be a valid reason to prevent all salmon farming in such areas. The relevant clause (now 6.7) has been slightly modified:*
6.7: The farm shall not be located within an area officially designated as "critical" or "sensitive" habitat (or equivalent terminology) with respect to wild salmon unless site-specific, valid, official documentation, supported by an environmental impact analysis, authorizing an exemption can be provided.

Biosecurity and Disease Management
The transfer of disease and parasites between farmed fish raised in net pens and wild fish, and the resultant impacts on the health of wild salmonids, is one of the primary areas of environmental impact in salmon aquaculture. Given this, the biosecurity and disease management section of these standards needs to be much more rigorous and needs to include standards which improve outcomes rather than just requiring coordination.

For example, standard 10.11 requires that: "The applicant shall have or be working toward the establishment and implementation of an Area Management Agreement that incorporates coordinated production and fallowing cycles, sea lice treatments, data sharing and, where considered necessary, nutrient monitoring."

While area management may be a step towards better management of disease, simply working towards it does not offer the measurable improvements necessary to meet the objective of environmental responsibility. Responsible production requires a measurable reduction of sea lice and disease pathogens in farming areas that results in levels not exceeding ambient levels found in areas without farms. Such a standard would substantially reduce the risk to wild fish.

Research conducted to date clearly demonstrates that epizootics can occur in wild fish as a result of transmission from farms (Krkosek and Hilborn 2011, Krkosek et al. 2007). New diseases are being identified on salmon farms and are a serious threat to wild fish (Palacios 2010).

One of the most significant and widely studied negative impacts of salmon aquaculture is the transfer of sea lice from farmed to wild fish. An overwhelming amount of published international research indicates that open net pen salmon farming poses serious threats to wild salmon survival, wild fish populations and marine ecosystems as a result of sea lice transfer (Holst et al. 2000; Butler 2002; Holst et al. 2003; Heuch et al. 2005; Krkosek 2007; Ford and Myers 2008; Costello 2009; Frazer 2009). A significant body of research on the impacts in British Columbia documents the same pattern of presence of net pen salmon farms, sea lice transfer to wild salmon, and wild salmon declines (Krkosek et al. 2007; Ford and Myers 2008; Connors et al. 2010; Krkosek and Hilborn 2011).

In addition to published papers, numerous scientific bodies have publicly highlighted the risks sea lice from net pen farmed salmon pose to the health of wild salmon:

- September 17, 2007 -- A letter to Steven Harper and Gordon Campbell from 18 esteemed Canadian scientists including Drs. Daniel Pauly, David Suzuki, Boris Worm and Alexandra Morton: "We the undersigned are convinced by the published scientific evidence that the debate is over; sea lice breeding on farmed salmon are threatening B.C.'s wild Pacific salmon."
- January 25-27, 2007 -- The consensus statement from a B.C. conference attended by over 30 Canadian and international scientists: "European governments (Ireland, Scotland, Iceland, Norway and the European Union) have recognized that salmon farming can be hazardous to the environment, including the proliferation of sea lice on salmon farms, posing significant risk to wild salmonids. And that the situation on the British Columbia coast has many parallels, but that the risks to pink and chum salmon are exacerbated by their small size at emergence into the marine environment" (Routledge et al. 2007).
- December 9, 2009 -- A recommendation from a scientist think tank made up of some of Canada's most esteemed fisheries scientists: "We must be prepared for the need for … additional precautionary measures such as experimentally removing farmed salmon from sockeye migration routes" (Reynolds 2009).

These impacts have been researched and documented while local and national regulations have been in place. Standard 10.12 – "The applicant shall demonstrate compliance with national or regional rules designed to minimize parasite reproduction and optimize control" -- is simply insufficient and ineffective. Conforming with regulations that have been demonstrated through the scientific literature to be inadequate to protect wild fish from the impacts of sea lice and disease transfer from net pen-farmed salmon is not a mark of environmental responsibility and does not reflect international best practices. Adequate protection of wild salmonids from sea lice and disease requires stringent siting regulations that do not allow net pen farms in areas where wild salmon migrate.

BAP: *There are differing opinions on this matter as reflected in the decision by the B.C. government to establish the Cowen Commission to investigate one instance of decline in wild salmon population to try and determine the cause.*

Also, impacts, if they occur, are likely to be specific to different countries, regions and species within them. Therefore, one generic standard risks being inappropriate and possibly counterproductive in all circumstances, as well as becoming outdated by rapidly developing science.

For these reasons, BAP defers to the rules promulgated by local fish health authorities and to their implementation under the direction of a fish health professional, who is best qualified and positioned to keep up to date with new developments and act accordingly. In doing this, the FHP is also subject to the codes and disciplines of the veterinary profession, which include environmental considerations.

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World Wildlife Fund -- U.S.

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General Comments
WWF-US has concerns about how the intent and strength of the BAP standards are communicated. The standards lead to only minimal improvements in environmental performance compared to the industry norm and to legal requirement for the majority of the key negative impacts of salmon aquaculture as identified by stakeholders. A number of the key environmental impacts of salmon farming are only lightly addressed in the draft standard, relying heavily on existing laws. While we commend the BAP for ensuring through an independent process that salmon farms are meeting the law on these issues, we see it as only a first step towards environmental responsibility.

It is not appropriate to refer to a standard of this level as an eco-label, or as being environmentally responsible. The intent of the standard and the target for certification must be more explicitly stated -- the GAA should not be selling this as a standard that assures that salmon is produced "through environmentally and socially responsible means," which is the claim currently being made by the GAA about the standard. A clear statement identifying the designed intent of excluding the laggards and adding a third-party verification of compliance with the law and possibly slightly better would eliminate misperceptions as to the rigor of the standards.

BAP: *The BAP salmon standards have been developed in a transparent manner, and their provisions are clearly laid out. Many of them go far beyond legal requirements. For example, those relating to fishmeal and fish oil conservation are far-reaching and have no parallels in existing regulations.*

It is only to be expected that different stakeholders will have different opinions on the strength of a particular standard, and there is certainly an ongoing debate about where to "set the bar" to generate the greatest overall improvements in the environmental and social performance of aquaculture. The BAP standards aim to raise the performance of a significant proportion of producers rather than to target limited elites, and this is now more fully explained in a revised introduction to the standards.

There are several points of inconsistency between the sections on "implementation" and the numbered standards -- there are details and what appear to be requirements in the implementation section that are not mentioned in the standards themselves. A review should be conducted to ensure consistency, and it needs to be clarified whether farms are legally bound to meet the requirements under both the implementation and standards sections.

BAP: *Agreed. The standards now correspond much more closely to the Implementation Guidelines.*

The standards only address the final production phase of farmed salmon -- growout. They fail to address the sometimes significant negative environmental impact that can be associated with the smolt production phase. It is not evident that the smolt production phase will be covered under the hatchery standard that has yet to be developed, since the smolt phase of production is not always the same company or site as the hatchery phase.

BAP: *The next project for the salmon technical committee will include a smolt standard.*

A number of the standards seem to be open to interpretation, and there is a risk of them being interpreted differently by different auditors. Will the committee that wrote the standards also have final sign-off on auditor guidance to ensure that the intent of the standard is consistently clear to auditors?

BAP: *We realize that written rules cannot address all eventualities. BAP also relies on the expertise, training and experience of ISO-65 certifying bodies and their auditors to achieve as much consistency as possible. The audit review process is an essential step, too. Standards are also refined in the light of case history.*

Specific Comments
Some comments on specific standards and issues are included below. We unfortunately do not have the time to provide comments on all of the standards, and the points below are only a subset of the comments that we would provide if we were to conduct a comprehensive analysis of all standards.

There is mention of a database that will allow farmers to submit data anonymously. All farms that are certified should be required to submit the full suite of data into the database. Within the standards, there is mention of some specific areas where farms will be required to submit data, but it is not evident that they will be required to submit data on all topics covered in the database.

Who will have access to this database? When will this database be developed, and how soon will the information from it be used to set numerical standards? The standard document should more explicitly state this.

BAP: *The Implementation Guidelines now state:*
In parallel with the implementation of these standards for salmon farms, the GAA intends to establish a BAP database to provide a knowledge base for the continuous improvement that is implicit in the BAP concept. The database will allow farmers to provide data anonymously on certain aspects of their operations, so that evaluation by independent scientists can lead to better future standards. The data that will or may be required once this database is established are noted in the individual standards that follow.

Standards related to water quality and benthic impacts (Section 4) are an example of an area where the standard relies too heavily on existing law. The standards require monitoring, but fail to set a maximum threshold of impact aside from existing law, which varies across jurisdictions.

BAP: *There are good reasons to avoid the temptation (at this stage) to create a global, metrics-based standard for sediment quality that can be usefully applied in the 12 countries where salmon are farmed. This view has been expressed by, among others, Dr. Jack Rensel in his public comments.*

The salmon technical committee favors the route of gathering information through the BAP database before presuming that it can improve on locally designed monitoring programs. All the same, the BAP requirements for sediment quality monitoring are clearly laid out, and they have significant implications for farms in areas with or without existing regulations.

Standard 4 also notes: "(Note: It is expected that an ISO standard for 'Environmental monitoring of the seabed impacts from marine finfish farms,' [ISO/TC 234/SC N 85 - ISO/CD 12878] will be finalized within two years, when it may be appropriate to require its protocols for this BAP standard. This will be kept under review by GAA and the above requirements shall apply in the meantime).

Standards 6.3 is unclear and must be clarified.

BAP: *Agreed. The escapes standard has been reworked. Former 6.3 is now covered by 6.6:*
6.6: The applicant shall provide documents to show that the variance between the projected and actual harvest numbers of fish from the last year class harvested was less than ± 3% after accounting for known losses.

Standards 6.4 and 6.5 appear to focus on limiting large escape episodes. However, as the standards are written, a farm can have up to two events of 9.9% loss, either in one production cycle or across two production cycles, and an unlimited number of small leakage events of less than 0.5%. It is not appropriate for a standard that allows for farms to have repeated significant escape events and high levels of leakage to be certified as environmentally responsible or as meeting best practice.

BAP: *The standard has been revised and made stricter, so that these percentages are now replaced by numbers of fish. The Implementation Guidelines now specify:*
- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*

Requirements related to the inclusion level of forage fish in feed within the salmon BAP standard do not encourage improvements in performance. The vast majority of, if not all, salmon farms currently already achieve a FIFO of 2.5 if one uses the calculation methodology provided by GAA.

BAP. *Agreed. The FIFO requirement has been lowered to 2.0 and to 1.5 from 2016. For comparative purposes, please note that the FIFO limit in the latest draft of WWF's Salmon Aquaculture Dialogue is effectively set at 1.6 (using the IFFO calculation method applied by GAA).*

This failure to encourage the use of alternative sources of feed is further compounded by a lack of environmental rigor in the feed mill standards. Under the GAA feed mill standards, the requirements related to the sustainability source of the fishmeal (FM) and oil (FO) are weak.

Under the standards, until 2015, feed mills can use FM and FO from any source, including fisheries known to be overfished and illegally caught fish, as long as the feed mill has a plan to try to avoid illegal and overfished sources. After 2015, the standard requires that only 50% of FM and FO be certified by either the MSC or IFFO, the latter of which is primarily focused on traceability rather than sustainability of the source.

BAP: *For global consistency on this critical issue, the BAP feed mill standards apply to any feed mill, whether it supplies feeds for salmon, shrimp, tilapia or other aquatic species. The notion that achieving a target of 50% certified fishmeal and fish oil is inadequate simply reflects a Western bias. Achieving certification of 50% of fishmeal and fish oil in Asia (the center of gravity of the aquaculture industry) would represent a major achievement in promoting sustainable fisheries in that region.*

The characterisation of the IFFO Responsible Supply standard as "primarily focused on traceability" is incorrect. Crucially, it incorporates the key components of the FAO Code of Conduct for Responsible Fisheries. Please download a copy from http://www.iffo.net/default.asp?contentID=636.

There appears to be no requirement for the other 50% of the FM and FO except that they fall under a plan to avoid illegal or endangered stocks. In summary, the salmon BAP standards, in combination with the feed mill BAP standards, fail to significantly address the key environmental impacts related to salmon feed. The standards encourage producers and feed mills to think about these issues, which has value in terms of encouraging the worst performers to improve, but it falls well short of what would be needed for the standards to be marketed as environmentally responsible.

Under standard 10, we support the inclusion of the requirement for farms to be a part of, or demonstrate movement towards, area management. Area management is an important tool for minimizing disease impacts. However, aside from this requirement, the standards related to disease management and to protecting wild fish populations rely too heavily on national and regional legislation.

It has been recognized by scientists in Norway that national sea lice legislation is not sufficiently protecting vulnerable wild Atlantic salmon populations in certain areas of Norway. The national sea lice legislation has also likely contributed to resistance of sea lice to the primary sea lice treatment, SLICE. As a result, sea lice levels have increased and been a challenge for farmers to control. Effective area management is also crucial for preventing resistance to therapeutants.

BAP: *There is full agreement on the importance of area management agreements. How to optimize sea lice controls was much debated by the Salmon Technical Committee and, with three Norwegian representatives (a veterinarian, an eNGO representative and a producer), the experience of Norway was fully considered.*

British Columbia Salmon Farmers Association

Campbell River, British Columbia, Canada

About B.C. Salmon Farmers Association
The B.C. Salmon Farmers Association represents the 6,000 people employed by the industry directly and indirectly. Among our members are all major salmon growers in the province, feed producers, shipping, value-added enterprises and more. Established in 1984, the association works to provide public education on salmon farming and to coordinate industrywide activities such as research activities and various committees and community events.

Thank you again for this opportunity to provide feedback on the draft salmon BAPs. Please contact us if there any questions regarding this submission.

GENERAL COMMENTS
Overarching issues
The GAA will be developing a BAP database which has undisclosed costs relating to information submission and traceability information. The data input will increase the cost of reporting and may prove burdensome and repetitive to the existing reporting systems internal to each company. Further analysis of the cost structure must be assessed. The BAP database requirement is unique as compared to other certification standards.

BAP: *The requirement for a workable solution for this database is well understood. The database must allow anonymous compilation of useful data to guide the development of the standards, but it must not impose unreasonable costs on program participants. The final details will be defined and approved by the Standards Oversight Committee because this issue is not exclusive to salmon.*

The Introduction now reads:
In parallel with the implementation of these standards for salmon farms, the Global Aquaculture Alliance intends to establish a BAP database to which BAP-certified farms will be required to contribute data anonymously for future GAA-sponsored research in the areas of sediment testing, disease outbreaks and treatments, escapes, accidental killing of wildlife and feed-based carbon:nitrogen ratios, as noted in the individual standards that follow. The data used will be protected so that its source cannot be identified and shall not be used without the agreement of participants in the BAP program.

Maintaining farm BAP certification in the future is reliant on BAP certification of the feed manufacturer and the development of BAP certification for hatcheries. Feed manufacturers will have to be BAP-certified within three years of adopting the standard, and feed manufacturers may adopt a different certification body. This may present implementation challenges.

BAP: *This requirement has now been modified. In the absence of a supply from a BAP-certified feed mill, the farm can obtain feed from a supplier that satisfies the key fishmeal and fish oil conservation component of the feed mill standards.*

Standard 4.2
Farms which meet regulations for pre-stocking, which is the measurement of organic accumulation at peak feeding, should not be required to do additional monitoring during the fallow period.

BAP: *This requirement in the previous 4.2 has been removed. However, in most cases, local regulations will determine what actually has to be done. There is a presumption of annual monitoring as in 4.1: "Three years and in the BAP annual audit." 4.3 requires monitoring at peak feeding in a cycle -- which is two years -- and where local regulations allow this, it seems reasonable.*

Standard 5.5
The fish in:fish out ratio should be calculated and documented the same as FCR and used as supportive documentation for BAP certification. This would enable a period to formalize the calculation rules and feed producers to meet BAP certification.

BAP: *Given the importance of the fishmeal and fish oil issue, the BAP standards require that the FIFO ratio be calculated and be below 2.0. Furthermore, this target will become stricter, falling to 1.5 in 2016.*

Standard 6.3
The GAA standards requires a +/-2% balance in saltwater inventory, after allowance for margin in error in the count from the hatchery. Documentation of inventory should be required to evaluate and reduce the measurement and estimation imprecision in monitoring fish numbers and biomass. This documentation will serve to identify accurate counting systems and methodology. There should be no metric until a standardized methodology can be identified.

BAP: *It's felt that an inventory standard still has an important role to play in managing and minimizing escapes. To this end, there is now greater clarity in the Implementation Guidelines and the relevant clauses state:*
6.5: If an escape is suspected or has occurred since the last audit, the applicant shall demonstrate, based on the counts of inventory required, that losses were less individually or cumulatively than the limits specified in the implementation requirements.
6.6: The applicant shall provide documents to show that the variance between the projected and actual harvest numbers of fish from the last year class harvested was less than ± 3% after accounting for known losses.

Standard 6.5
…single escape event of 10% or more of the farm's total inventory. British Columbia marine farms operate under Best Management Practices which minimize risks of escapes during activities like harvesting, grading, towing, operating boats and changing nets. Regulation sets clear standards for net cages, net inspection and other containment structures. There are four kinds of inspections:
- Daily, visual inspections
- Periodic complete net inspections of each net cage or other containment structures
- Underwater net inspections
- Complete, out-of-water net cage servicing and inspections.

Every fish farm has a written Escape Response Plan, which is visible to staff and supported by appropriate training. All escapes -- or suspected escapes – must be reported within 24 hours of their discovery. All of these provisions are in place to minimize the risk of escapes and accountability.

BAP: *Please refer to the modified escape standards (Section 6), which reinforce these and additional best management practices, and also set limits on numbers of escaped fish.*

Standard 6.5 should be removed and compliance of 6.7 and 6.8 should cover escapements. If an escapement occurs, it is the failure of implementing policy and procedure which should be considered and not the 10% metric. Escapes beyond applicant's control, as indicated, should not suspend certification.

BAP: *However, the standard should aim to ensure that the farm does follow the process and provide some final check.*

Cermaq ASA

Ian Carr
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In general, we find the salmon farm standards to be reasonable and balanced. We agree that such a standard has utility in promoting responsible salmon farming practices. However, we would like to make specific comments as detailed below.

Further, we would also like to understand if and how the certification process for such a standard could be aligned with established auditing processes for ISO management standards already being adopted by Mainstream group (i.e., ISO 9001, 14001, 22000 and OHSAS 18001). Clearly, we have concerns in connection with costs and workload for adopting a further standard.

BAP: *The ISO environmental standards are very generic, and they allow for distinct environmental monitoring and management plans to be written and applied for each individual farm. As such, they are not considered to be an alternative to a standardized, global, aquaculture-specific program like BAP. All the same, it is likely that there will be major overlaps between environmental management as applied for ISO and as required for the BAP standards. Obtaining the BAP standard should in some cases obviate the need for ISO, but in the end, it will be the farm's customers who specify which standard(s) is/are required to provide the necessary environmental and other assurances.*

BEST AQUACULTURE PRACTICES CERTIFICATION
Text to change: Verification of the implementation of corrective actions must be submitted to the certification body within 28 days of the evaluation. (Major non-conformities typically reflect issues with general policies.)

Proposed text: Corrective actions with a timetable for verification of the implementation must be submitted to the certification body within eight weeks of the evaluation. For companies certified according to ISO 9001 and having the BAP salmon farms standards integrated to their system, the certified auditing company sets the timeframes. In such a case, both standards can be audited simultaneously.

Reason for change: No distinction in timeframe is made between minor or major non-conformity. Verification of the implementation of corrective actions may depend on public officers or suppliers/contractors, and 28 days will then often prove insufficient. Issues pertaining to food safety, environmental impact or occupational hazards are strictly regulated in the countries where salmon is farmed, so major issues will be dealt with as fast as possible.

BAP: *Some auditors who inspect to BAP standards are also ISO trained, so there are opportunities for farms to arrange for combined audits and cost savings.*

Environment: Fishmeal and Fish Oil Conservation
Text to change: In addition, by improving the efficiency with which feed is converted into fish biomass, farmers can lessen the amount of fishmeal and fish oil used.

Proposed text: None. Delete this text.

Reason for change: The statement is technically wrong, as there is no direct link between FCR and the amount of fishmeal and fish oil used in the diets. A diet low in marine raw materials will generally be a diet with a higher FCR, and yet with an improved utilization of the marine raw materials.

BAP: *Correct. To be technically correct, the statement should include the clause "for a feed with a given fishmeal and fish oil content." As it stands, the statement calls for efficient feed management and good survival rates to obtain good FCRs, without considering the trade-off between the nutritional quality of the feed and the resulting FCR.*

Text to change: 5.1: The applicant's facility shall use feed that indicates its wild fishmeal and fish oil content or feed fish inclusion factor.
Proposed text: The applicant shall maintain records of the amount of fishmeal and fish oil in feed, that originates from wild feed fish.

Reason for change: Wording changed for clarity and ease of application. "Wild feed fish" should then be explicitly defined in the document. We propose that the same emphasis is applied in the BAP feed mill standards as well as in the salmon farm standards.

BAP: *The standard has been modified. The farm can either obtain its feed from a BAP-certified mill or from a mill that satisfies the fishmeal and fish oil conservation clauses of the feed mill standards. For content declarations, the alternative of declaring a feed fish inclusion factor rather than the content of oil and meal from wild fish enables feed mills to supply the required information in a format that does not reveal some aspects of diet formulation that could be considered proprietary.*

Standard 5.5
Text to change: Remove all references to and use of fish in:fish out ratios and change standard 5.5.

Proposed text guideline: The efficiency of salmon farming can be measured through nutrient ratios for marine protein and marine oil. The amount of each marine-derived nutrient used to feed salmon is divided by the amount of each nutrient produced as a result of salmon farming.

Standard: 5.5: The facility shall calculate and achieve a marine protein dependency ratio of X (e.g., 1.1) or less and a marine oil dependency ratio of Y (e.g., 1.2) or less.

Reason for change: We do not agree that FIFO is a useful metric for measuring the ecological efficiency of an aquaculture system. For our detailed reasoning, please refer to the following scientific publication: Crampton et al. (2010)1 Demonstration of salmon farming as a net producer of fish protein and fish oil. Aquaculture Nutrition. Volume 16, Issue 4, August 2010, Pages: 437–446. We propose that the same emphasis is applied in the feed mill standards as well as in the salmon farm standards.

BAP: *Despite the good attributes of the alternatives you propose, salmon farming needs to be able to account for itself when confronting the common complaint that it is a net drain on world fish supplies because it consumes more wild fish than it produces. Thus, when it comes to this issue, it's the fish in:fish out ratio that generates a single number to answer the question that most (but certainly not all) people are currently asking.*

In addition, the BAP program aims to apply the FIFO calculation in a consistent way with other species, including Pangasius, tilapia and trout, which are freshwater species that technically don't produce any "marine" oils and proteins at all and for which your proposed metrics wouldn't be appropriate.

Community: Community Relations
Text to change: Farms shall provide barriers that limit entry by unauthorized persons and post signs that identify possible safety hazards.

Proposed text: Farms shall clearly identify farm property and post signs that identify possible safety hazards.

Reason for change: On sea-cage sites, it can be challenging to ensure full physical barriers to unauthorized entry.

BAP: *Agreed. New wording:*
2.2: The applicant shall clearly identify farm property lines and post signs that warn the public and staff of potential safety hazards.

Environment: Predator & Wildlife Interactions
Text to change: 7.8: The applicant shall not use acoustic harassment devices to control predators

Proposed text: Remove.

Reason for change: The industry needs to have a mix of tools to use in a balanced way to avoid predators attacking the farms. A limited use of acoustic deterrent could be a part of this. There would appear to be sufficient coverage for the protection of predators and wildlife in the remaining standards.

BAP: *Agreed. New wording to 7.9:*
7.9: The applicant may only use acoustic harassment devices to control predators if independent expert opinion verifies that their use will not harm endangered, protected or threatened species or any cetaceans.

Animal Health & Welfare: Farm Management Measures
Text to change: A requirement to move to use of closed well boats when transporting fish, as methods and equipment become available.

Proposed text: Where significant fish health risks are identified, a requirement to move to use of closed well boats when transporting fish, as methods and equipment become available.

Reason for change: Closed well boats are a costly measure where the benefits should justify the extra cost involved. In many situation, e.g., when fish are documented free of disease or for transport within a defined area, this measure is not necessary.

BAP: *This potential cost burden would be something to include in the review of the standard in 18 months time.*

Environment: Fishmeal and Fish Oil Conservation
FIFO Ratio
Text to change: NOTE: Inconsistency in default yield values should be addressed.

Reason for change: The default yield values used for the so-called “feed fish inclusion factor” differ between the BAP feed mill standards (p. 7) and the BAP salmon standards (p. 6):
FM yield, FO yield
BAP Feed Mills -- 22%, 8%
BAP Salmon Farms -- 22.5%, 5%

BAP: *Agreed. Defaults should be 22.5% and 5%.*

Community: Worker Safety & Employee Relations
Text to change: 3.3: The applicant shall have a verifiable employment policy written in the employees’ predominant language that bans forced, bonded and child labor by workers under 15 years old.

Proposed text: 3.3: The applicant shall have a verifiable employment policy written in the employees’ predominant language that bans forced labor, bonded labor and child labor (as defined under ILO Convention 138).

Reason for change The text is ambiguous, and child labor is a more complex issue than can be addressed by setting a simple age limit, especially where working conditions may be hazardous.

BAP: *Agreed. New wording:*
3.3: The applicant shall have a verifiable employment policy written in the employees’ predominant language that bans forced and bonded labor, and child labor shall never be used outside the existing ILO conventions and standards.

Environment: Control of Escapes
Text to change: 6.6: The farm shall not be located within an area designated as “critical” or “sensitive” habitat (or equivalent terminology) with respect to wild salmon unless site-specific, valid documentation authorizing an exemption can be provided.

Proposed text/reason for change: This requires some further definition of precise meaning of “critical” or “sensitive” habitats.

BAP: *Some new wording added:*
6.7: The farm shall not be located within an area officially designated as “critical” or “sensitive” habitat (or equivalent terminology) with respect to wild salmon unless site-specific, valid, official documentation, supported by an environmental impact analysis, authorizing an exemption can be provided.

Living Oceans Society

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Thank you for the opportunity to comment on the Global Aquaculture Alliance's draft salmon standards. Our organizations have been working on finding solutions to the impacts of salmon aquaculture for many years, including collaborative research and technological development with Marine Harvest Canada.

Living Oceans Society and the Georgia Strait Alliance are based in coastal communities whose economy and culture have developed through the availability of marine resources. Environmental and social responsibility of all sectors that utilize marine resources in our area is necessary in order to maintain and further develop a diverse economy that can support coastal communities like ours.

For this reason, we are particularly interested in the development of standards to encourage responsible aquaculture production, but understand that in communities dependent on marine resources, a real level of environmental protection must be attained for economies and the ecosystem to thrive.

We have included detailed comments on the specific standards below, but would first like to emphasize that the stated objectives of the GAA salmon standard to "specifically address environmental and social responsibility," and "promote[s] environmentally responsible use of land, water, nutrients and other resources for aquaculture production," are not upheld by the requirements outlined in the standard at this time. While the narrative sections of the standards at times discuss broader goals and improvements in practices, the standard requirements themselves primarily rely on farmed salmon producers to meet local regulations. This is not sufficient for meeting the objective of environmental and social responsibility.

There is a large body of research demonstrating that net pen salmon farms are negatively impacting wild fish and marine ecosystems, even with existing regulatory requirements (e.g., Butler 2002, Holst et al. 2003, Heuch et al. 2005, Krkosek et al. 2007a, Krkosek et al. 2007b, Ford and Myers 2008, Costello 2009, Frazer 2009, Connors et al. 2010, Krkosek and Hilborn 2011). In addition, there are significant differences in the stringency of regulations, data transparency, and environmental and social impacts in the major farmed salmon producing regions of the world.

The preamble acknowledges this, but the standards themselves still rely on local regulations rather than setting improved performance standards by articulating "the best international laws" as the introduction states. Depending upon current regulations to manage the impacts of salmon aquaculture is not sufficient to encourage continuous improvement and is not sufficient to market a product as "environmentally and socially responsible."

We recommend below a (number of comments on how the) standards can be strengthened and encourage the technical and oversight committees to incorporate these recommendations in the next draft. We also strongly recommend that the GAA hold a second period of public comment after the next recommendations are adequately considered.

Salmon aquaculture is not an easy task, and there is much knowledge and research from stakeholders that needs to be considered at the outset. Further to this, all public comment needs to be posted in a publicly accessible manner, such as on the GAA website, and responses to the concerns raised need to be posted by the committees to increase the transparency of the standards being considered.

BAP: *Agreed. All comments and responses will be posted accordingly on the GAA website.*

The preamble to the standards has been modified to better reflect the aims and scope of the BAP program. In key areas, the standards go far beyond existing regulations, and this justifies the social and environmental claims of the program.

The most far-reaching impact of salmon farming is commonly identified as its impact on wild fisheries through its use of fishmeal and fish oil in compounded feeds. There are no regulations that address this impact, but the BAP salmon standards have requirements for sustainable sourcing of these ingredients and for their efficient usage, with a requirement for a fish in:fish out ratio of 1.5:1 in five years. To deal with more localized impacts, farms are required to create or to participate in area management agreements to control pests such as sea lice. Also, there are provisions on containment and escapes to reduce the risks of impacts on wild salmon populations.

Comments on Specific Standards
Community Relations
The community relations section of the standards does not adequately address community use conflicts that are occurring in major salmon-farming regions.

Standard 2.1 states: The applicant shall accommodate local residents by not unnecessarily blocking access to fishing areas and other public resources. This leaves “unnecessarily blocking” open to interpretation and fails to address user conflicts that arise when aquaculture reduces the viability of local marine resources. The 1990 R. v. Sparrow decision by the Supreme Court of Canada ruled that aboriginal harvests of fish for food, social and ceremonial purposes have a priority in resource allocation (Supreme Court of Canada 1990).

Many First Nations groups affected by the operation of net pen salmon farms in their traditional territories have raised concerns about mercury contamination originating from salmon farms, the impact of untreated waste and chemicals on clam beaches, shrimp and prawns, and the decline of wild salmon due to the transfer of sea lice and disease between farmed and wild salmon.

In 2009, First Nations in the Broughton Archipelago launched a class-action lawsuit against the B.C. government for damages caused by salmon farming to wild salmon stocks, a traditional food source. The B.C. Supreme Court class-action suit involves eight First Nations in the area, which are seeking:

- A declaration that the way the province has authorized and regulated salmon farms has contributed to a significant decline in the wild salmon stocks and infringed on natives' constitutional fishing rights.
- An injunction prohibiting the issuing of salmon aquaculture permits in the Broughton Archipelago pending adequate consultation and accommodation with natives.
- A declaration that the province must remediate the impact of salmon farms on wild salmon (Vancouver Sun 2009).

Salmon farms in the region where legal action is being pursued could technically meet standard 2.1 without meeting the intent of the Community Relations section. When local communities need to resort to legal action to protect access to traditional food sources, which fortunately for Aboriginal people in Canada they have legal rights to, it is difficult to argue the product is being produced in a socially responsible manner.

However, GAA certification will market certified products as socially responsible to buyers and consumers. The Community Relations section needs to adequately address impacts on resources used by indigenous groups and the operation of aquaculture sites in traditional territories before being able to legitimately claim social responsibility.

BAP: *The standard has now been modified to:*
2.1: The applicant must demonstrate that the farm does not prevent access to fishing areas and other public resources. Where access is not direct, the applicant must provide signage and a written access plan demonstrating consideration of biosecurity, employee and public safety.

Standard 2.4 states: The applicant shall record, review and respond to reasonable complaints and requests for information received from the public. This standard, while well intended, lacks the necessary teeth.

“Reasonable” requires a definition, and there needs to be binding language that requires the data relevant for understanding local impacts, such as disease, sea lice, and antibiotic and parasiticide treatments, to be made available upon request. The current standard simply implies a response is required to requests for information, and a response can of course be negative; hence, as currently written, it does not mandate any meaningful intention to share information. The best international practices provide quick public access to this type of information at no charge. There have also been a number of rulings from regulatory and governmental bodies requiring companies to provide these data to stakeholders and public inquiry processes.

BAP: *Agreed. New wording added to Standard 2.4:*
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.

Sediment and Water Quality
The Sediment and Water Quality section begins with the goal of each farm being “located and operated in such a way that they do not have significant negative impacts on sediment quality... or water quality.” However, the standards themselves rely exclusively on the requirements set in local operating permits. There are no standards that require best international practices to be met or continuous improvement over time.

While monitoring is required, with a mention of the eventual creation of a BAP database, no actions need to be taken based on these results other than following local regulations. For a standard purporting to promote environmentally responsible practice, this fails to set a common threshold of performance for all GAA-certified salmon farms and does not achieve the stated goal of having no significant negative impacts.

BAP: *There are good reasons to avoid the temptation (at this stage) to create a global, metrics-based standard for sediment quality that can be usefully applied in the 12 countries where salmon are farmed. This view has been expressed by, among others, Dr Jack Rensel in his public comments.*

The salmon technical committee favors the route of gathering information through the BAP database before presuming that it can improve on locally designed monitoring programs. All the same, the BAP requirements for sediment quality monitoring are clearly laid out, and they have significant implications for areas with or without existing regulations.

Fishmeal and Fish Oil Conservation
The section on fishmeal and fish oil conservation opens with a statement that discounts the importance of small fish to human consumption. Forage fish have been, and still are, consumed by humans. Leading researchers have documented the technological advances in processing and a number of consumer campaigns in the developing world that are increasing the direct human consumption of forage fish.

Consumption increases are most marked in the developing world, where traditional stocks are depleted and other sources of protein are too expensive or difficult to buy (Alder and Pauly 2006). The role of forage fish fisheries for economic wellbeing and food security along the coasts of Chile and Peru has increased since the 1970s (ibid). Globally, pelagic fish are an incredibly important component of human diets; pelagic fish contribute more than 50% of total fish supply in more than 36 countries (Tacon and Metian 2009). Small pelagic fish are particularly important in developing countries where malnutrition remains the leading cause of death.

Food fish is a major source of animal protein for about half of the Sub-Saharan Africa population, an area home to 206 million undernourished people (24% of the world total). Some of the marine small pelagic fish consumed in Sub-Saharan countries is locally caught; however, imported lower-cost species such as mackerels, herrings, pilchards/sardines and anchovies are an important part of their diet. The Sub-Saharan region is the only region of the world where per-capita consumption of fish has fallen, and aquaculture only accounts for 3% of fish consumed (ibid).

For a standard that intends to promote environmentally and socially responsible practices, the impact of feed ingredients must be more seriously addressed to reduce the dependence on wild fish and create incentives for continuous improvement over time. The standards as currently written are weak in terms of definitions — “sustainable fisheries” is not defined in the preamble and is not required in the standards, the implementation time of three years to meet the feed mill standards is too long, and the traceability requirements are too low. The calculation for the fish in:fish out ratio allows fishery and aquaculture by-products to be excluded, which makes the allowance of 2.5 fish in a very low bar. Much better fish in:fish out ratios are already being attained by industry, and the GAA standards should reflect best practices to meet their stated goals. In addition, a standard needs to be included that creates an incentive for continuous improvement of the fish in:fish out ratio over time.

BAP: *The importance of fishmeal and fish oil conservation is fully understood. Hence the standard now includes provisions on sustainable sourcing and requires a tighter fish in:fish out ratio limit (2.0) that falls over time to 1.5 in 2016.*

Control of Escapes
The procedural, performance, documentation and reporting requirements for escape prevention require the same types of measures commonly contained in local regulations. These requirements for prevention and recovery plans in the event of an escape have proven insufficient to prevent escapes or to re-capture a significant portion of the fish when escapes occur.

Despite new guidelines for net strength and pen system anchoring in Canada, BC MAL reported more than 100,000 escaped farmed salmon in 2008, more than the previous six years combined. In 2009, escapes of 72,000 Atlantic salmon were reported (BC MAL 2010). In a typical incident in 2009, over 40,000 Atlantic salmon escaped, and only 1,200, or 3%, were recovered (Courier Islander 2009).

On a site basis, standard 6.4 is a very weak requirement: The applicant shall demonstrate by reference to detailed stock records that there have not been three or more escape events of 0.5% or more of the farm’s total inventory during the last two production cycles.

Given the significant impacts of escaped farmed salmon on wild populations as noted in the narrative of this section, a lower threshold for permitted escapes is necessary to meet the objectives of environmental responsibility. This is particularly true in areas where native salmon stocks have declined.

When the escaped fish are the same species as wild salmon in the area, the large amount of net pen escapes relative to the small number of local wild salmon put wild stocks at high risk of genetic disruption through interbreeding (Morris et al. 2008). Even comparatively small differences in genetic traits can result in changes that affect traits closely related to the ability of a population to maintain or increase its numbers in succeeding generations. The result of this genetic disruption is lower rates of survival of populations over time (Darwish and Hutchings 2009).

While it is commendable that certification would be revoked if standard 6.4 is breached, the inclusion of the statement that corrective action is required “when these are matters that the applicant can reasonably be expected to control” provides a loophole for escapes caused by major weather events and the like. While the company cannot control the weather, farms need to be designed to withstand major weather events, especially as major storms increase in frequency and intensity.

Standard 6.5 -- The applicant shall demonstrate by reference to detailed stock records that there has been no single escape event of 10% or more of the farm’s total inventory -- sounds very stringent. However, the ability for farms to recertify after an inspection means this standard would be more accurately written as, “...there has been no single escape event of 10% or more of the farm’s total inventory. When an escape over this magnitude occurs, reinstatement of BAP certification shall be subject to an independent engineering and operational review,” as this is what the narrative allows.

Standard 6.6 could potentially offer significant protection of wild salmon from the impacts of escaped fish; however, the lack of definition for how and by whom “critical” or “sensitive” habitats for wild salmon are to be designated negates this potential. Many habitat protection designations for wild salmon are limited to their freshwater spawning habitats because their marine migrations are broad and specific routes are sometimes unknown.

Therefore, this standard will not have many useful applications. In ocean areas where salmon farming occurs, it would be more effective to require wild salmon migratory areas to be avoided than depend on habitat designations that have not yet been applied to the marine portion of wild salmon's life cycles.

BAP: *The standard on escapes has been rewritten to replace percentage limits with numerical values, making it stricter. The Implementation Guidelines now specify:*

- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*

In both cases, reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review and risk assessment to determine the cause or causes of escapes, and to recommend corrective action where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken.

Biosecurity and Disease Management

The transfer of disease and parasites between farmed fish raised in net pens and wild fish, and the resultant impacts on the health of wild salmonids, is one of the primary areas of environmental impact in salmon aquaculture. Given this, the biosecurity and disease management section of these standards needs to be much more rigorous and needs to include standards which improve outcomes rather than just requiring coordination.

For example, standard 10.11 requires that: The applicant shall have or be working toward the establishment and implementation of an Area Management Agreement that incorporates coordinated production and fallowing cycles, sea lice treatments, data sharing and, where considered necessary, nutrient monitoring. While area management may be a step towards better management of disease, simply working towards it does not offer the measurable improvements necessary to meet the objective of environmental responsibility.

Responsible production requires a measurable reduction of sea lice and disease pathogens in farming areas that results in levels not exceeding ambient levels found in areas without farms. Such a standard would substantially reduce the risk to wild fish.

Research conducted to date clearly demonstrates that epizootics can occur in wild fish as a result of transmission from farms (Krkosek et al. 2007b, Krkosek and Hilborn 2011). New diseases are being identified on salmon farms and are a serious threat to wild fish (Palacios 2010).

One of the most significant and widely studied negative impacts of salmon aquaculture is the transfer of sea lice from farmed to wild fish. An overwhelming amount of published international research indicates that open net pen salmon farming poses serious threats to wild salmon survival, wild fish populations and marine ecosystems as a result of sea lice transfer (Holst et al. 2000, Butler 2002, Holst et al. 2003, Heuch et al. 2005, Ford and Myers 2008, Costello 2009, Frazer 2009). A significant body of research on the impacts in British Columbia documents the same pattern of presence of net pen salmon farms, sea lice transfer to wild salmon, and wild salmon declines (Krkosek et al. 2007a, Krkosek et al. 2007b, Ford and Myers 2008, Connors et al. 2010, Krkosek and Hilborn 2011).

In addition to published papers, numerous scientific bodies have publicly highlighted the risks sea lice from net pen farmed salmon pose to the health of wild salmon:

- September 17, 2007 -- A letter to Steven Harper and Gordon Campbell from 18 esteemed Canadian scientists including Drs. Daniel Pauly, David Suzuki, Boris Worm and Alexandra Morton: "We the undersigned are convinced by the published scientific evidence that the debate is over; sea lice breeding on farmed salmon are threatening B.C.'s wild Pacific salmon" (ECO 2007).
- January 25-27, 2007 -- The consensus statement from a B.C. conference attended by over 30 Canadian and international scientists: "European governments (Ireland, Scotland, Iceland, Norway and the European Union) have recognized that salmon farming can be hazardous to the environment, including the proliferation of sea lice on salmon farms, posing significant risk to wild salmonids. And that the situation on the British Columbia coast has many parallels, but that the

risks to pink and chum salmon are exacerbated by their small size at emergence into the marine environment" (Routledge et al. 2007).

- December 9, 2009 -- A recommendation from a scientist think tank made up of some of Canada's most esteemed fisheries scientists: "We must be prepared for the need for …additional precautionary measures such as experimentally removing farmed salmon from sockeye migration routes" (Reynolds 2009:1).

These impacts have been researched and documented while local and national regulations have been in place. Standard 10.12 -- The applicant shall demonstrate compliance with national or regional rules designed to minimize parasite reproduction and optimize control -- is simply insufficient and ineffective.

Conforming with regulations that have been demonstrated through the scientific literature to be inadequate to protect wild fish from the impacts of sea lice and disease transfer from net pen farmed salmon is not a mark of environmental responsibility and does not reflect international best practices. Adequate protection of wild salmonids from sea lice and disease requires stringent siting regulations that do not allow net pen farms in areas where wild salmon migrate.

BAP: *The BAP salmon standards are specifically designed to minimize the environmental impacts of marine cage farms.*

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Paulo Jorquera Olave

2. Community Relations
Farms shall strive for good community relations, conduct their businesses responsibly and be responsive to those affected by their operations.

How we can define if we have a local community (distance criteria?)

BAP: *A good question that is very hard to answer. Sorry.*

4.2: Monitoring for organic accumulation and biological diversity in sediments immediately beneath the farm and at prescribed distances from it shall be undertaken at the time of peak feeding during the production cycle and following a fallow period between cycles.

What is the fallow period before the next cycle ? What are the criteria to define the number of points to monitoring?

BAP: *To provide more clarity, we have added more details to this standard. The Implementation Guidelines now specify:*
In countries or regions where sediment monitoring is not required as described above and/or where an allowed sediment impact zone is not defined, applicants shall write and implement a monitoring plan, which shall require them to:

- *Nominate an independent individual or company with demonstrated expertise in sediment sampling and analysis to design a sediment sampling and analysis program appropriate to the farm conditions and to conduct sediment monitoring as required below.*
- *Chart an allowable sediment impact zone that shall not exceed the total area of the farm plus a boundary zone of 40 meters around it for contiguous (steel) cages and 25 meters for circular cages that are set out individually. The footprint may be shifted in any direction to account for normally occurring uneven current patterns, as long as the total area remains the same.*
- *Monitor the organic build-up on the seabed within this zone by the method deemed best for the type of sediment that exists there. The choice of method shall be justified by prior documentation of the type of sediments over which the farm is located.*

- *Conduct sediment sampling to coincide with the period of peak feeding during each crop cycle. (Note: Standard 10 requires single year class stocking for fish health reasons, therefore all BAP-certified farms must operate on a cyclical production schedule.) Samples shall be taken along at least two transects that pass directly through the farm and that align with the dominant flow of water at the farm site. One sample with five replicates shall be taken at the edge of the farm and another at the 25-meter or 40-meter boundary (see above).*
- *Five replicate samples shall also be taken from at least two reference stations within 1 kilometer of the farm that have similar depth and sediment characteristics as occur at the farm.*
- *Demonstrate by statistical analysis of the results that there is no organic build-up at the boundary of the allowable sediment impact zone by comparison to the reference station, as determined by the monitoring method chosen.*
- *Collect and store data from which the farm's feed-based carbon and nitrogen discharges can be calculated for possible future submission to the BAP database as required for other farms above.*

6.5: The applicant shall demonstrate by reference to detailed stock records that there has been no single escape event of 10%or more of the farm's total inventory.

What happens in the case of robbery?

BAP: *Proven theft would be interpreted as an extenuating circumstance and would not lead to suspension of a certificate. The limits for escapes are now defined in numbers rather than percentages. There are two trigger limits that can lead to suspension of BAP certification. The Implementation Guidelines specify:*
- *In both cases [of suspension due to escapes], reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review and risk assessment to determine the cause or causes of escapes, and to recommend corrective action where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken.*

7.1: The applicant shall have a written Wildlife Interaction Plan that meets the BAP requirements for training, procedures, records, risk assessment (if needed) and reporting outlined in the guidelines.

In our case, this is a long-time analysis because sufficient information for the sectors does not exist.

BAP: *The relevant clause now states:*
7.2: Local rules notwithstanding, the applicant shall demonstrate that it has a written Wildlife Interaction Plan (WIP) consistent with the implementation requirements above and that it complies with the procedural, performance and reporting requirements therein.
Thus, the standard does require a Wildlife Interaction Plan to be written before a farm can be certified, and there will be cost associated with creating a plan.

The Implementation Guidelines specify:
- *The WIP shall also include but not be limited to:*
- *A list of relevant local laws and specific conditions of the farm's operating permits that apply to wildlife management and protection.*
- *A list of local species classified as endangered or threatened under local laws and/or listed as "critically endangered" or "endangered" on the IUCN Red List.*
- *A map that identifies officially designated "critical" and/or "sensitive" marine and coastal habitat in the region. If the farm is in an area so designated, a list of the classified or endangered sedentary species within a 2-kilometer radius of the farm and of mobile coastal species within the region shall also be included, updated where necessary to show wildlife populations established after the farm was started.*
- *Independent expert risk assessment of the farm's possible interactions with the wildlife in the critical or sensitive habitat, if this has not been considered by regulators in granting the farm's license(s).*
- *Procedures to deal with risks identified in the expert assessment.*
- *Training for farm staff in recognizing endangered, threatened and protected species they may see from the farm and a system for reporting and recording such observations.*
- *Designation of one member of staff to carry out lethal control measures, if needed, and for training of that individual in humane slaughter methods.*
- *Description of the farm's passive measures to deter the entry into cages of predatory birds or mammals.*

- *Description of the farm's passive measures to protect cages from underwater attack by marine mammals.*
- *Procedures for the regular inspection of cages to check and report the integrity of the passive measures.*
- *Documentation to show that any active but non-lethal deterrent measures used are approved by regulators, approval being supported by a review of environmental impacts with specific reference to endangered, protected, threatened or cetacean species in the area. Such devices may not be deployed if the review shows that they may adversely affect these species.*
- *Reporting procedures in the event that control measures cause the accidental death of wildlife and for proposed action to prevent the same from happening again. Reports of these instances shall also be made to the BAP salmon database when this is established.*
- *Procedures that state lethal methods shall only be used after non-lethal methods are attempted and must be legally approved.*
- *Procedures that make it clear that deliberate lethal controls on species classified as endangered or threatened are not to be used except under exceptional circumstances, such as risk to human life, and then only after specific written authorization is obtained from the regulator.*
- *Procedures for regulatory authorization, implementation and reporting of lethal control measures when these are deemed necessary.*

7.6: The applicant shall provide site maps or other documentation that show the farm is not within an area designated as "critical" or "sensitive" habitat (or equivalent).

Is a Google map considered valid where such "critical or sensitive" habitats are marked according to the official information?

BAP: *Yes.*

11.7: Ice in which fish are placed following harvest shall be made from potable water or disinfected seawater.

What are the disinfection criteria?

BAP: *For seawater, filtration and UV sterilization or chlorination/dechlorination or equivalent methods would do the job.*

David Suzuki Foundation

Jay Ritchlin, Director of Marine Conservation
Vancouver, British Columbia, Canada

The Salmon and Trout Association

Paul Knight, Director
London, England, U.K.

Thank you for the opportunity to comment on the GAA's draft salmon standards. We have included some general comments in our letter as well as some detailed comments on the standards themselves.

Overall, we think the goal of having a set of standards to remove the worst actors from the salmon farming industry, if the standards are messaged to buyers and consumers in the appropriate form. We understand from the first paragraph that Best Aquaculture Practices (BAP) "verifies environmentally and socially responsible processes under which fish are produced." We do not accept the claim that farms that meet these standards are environmentally and socially responsible.

There is simply not enough strength in the current standards proposal or in the certification process for BAP to justify the claim of “responsible production” at this point in time. There is a vast body of peer reviewed scientific data that demonstrates that there are significant conservation issues associated with the siting and operation of salmon farms in coastal areas around the world. These problems currently lack solutions, and it is questionable if it is possible to bring them up to a standard that would be considered socially and environmentally responsible. The best you can hope to achieve with these standards is socially and environmental improvement.

BAP: *Even if there is disagreement about the definition of social and environmental responsibility, the BAP program is still an important vehicle for social and environmental improvement in the aquaculture industry.*

We would like to emphasize this point very clearly, as any attempt to continue this message will result in a public condemnation and admonishment, including communicating these concerns to all of our retail partners.

BAP: *It would be fair to communicate that the BAP program can deliver significant social and environmental improvements in the salmon industry and that it deserves retailer and consumer support on this basis.*

We are concerned that the standards only address the final production phase of farmed salmon production (growout) and fail to address the sometimes significant negative environmental impact that can be associated with smolt production.

BAP: *Smolt standards are very important. The next task of the salmon technical committee is to write smolt standards.*

We are also very concerned that under your certification scheme, a farmed salmon product could be certified by ACC with only having the processing plant certification. Once again, this sends the wrong message to consumers, and we are against this approach.

BAP: P*lease note that the auditing and certification roles in the BAP program are now filled by independent, ISO-compliant conformity assessment bodies that have taken over from the ACC (Aquaculture Certification Council). For information on the BAP retail mark and how it’s used, please refer to http://www.gaalliance.org/bap/retailmark.php. The BAP program covers processors and feed mills, as well as farms.*

Another major concern that we have is that there is currently no plan for a second public comment period so that we may see how our concerns were considered and integrated.

BAP: *Please refer to the full extent of the public comments and responses to see how the standards have been modified in significant ways to take advantage of input from a wide variety of stakeholders. The documented procedures for the development of BAP standards (http://www.gaalliance.org/ cmsAdmin/uploads/BAP-Proc.pdf) neither require nor prevent a second public comment period. Whether one is held is at the discretion of the Standards Oversight Committee.*

We further request that a response to our concerns and those of other stakeholders that comment be posted on the same website to increase the transparency and rigor of the public comment aspect.

BAP: A*ll comments and responses are posted online on the GAA website at http://www.gaalliance.org/bap/comments.php.*

The document is also full of standards that rely on government regulation. This is not acceptable for an ecolabel, as doing so overlooks the fact that the failure of adequate government regulation has created the need for an ecolabel in the first place. Furthermore, the government is not an objective source of information, given their mandate to encourage economic growth. These must be replaced by rigorous metrics-based standards where possible.

BAP: *Metrics are helpful where the accuracy of measurement can be relied on, where their relevance in different regions is comparable and as long as they lead to workable solutions and promote rather than stifle innovation. Hence, the BAP salmon standards include, for example, metrics for the fish in: fish out ratio, for escapes and for stocking inventories. For some aspects, for example sediment quality, the BAP standard does build upon existing regulations rather than attempt to set metrics. Sometimes, in the absence of the necessary database, this is a better approach than trying to shoe-horn every salmon farm into a set regime that may be a very poor fit.*

Finally, the use of the word “should” is a problem in this document as it creates too much flexibility to accurately judge the credible implementation of these standards. For a standard to be credible, the standards requirements must be clear so that the consumer is clear about what the standards cover. While we recognize that there are no "shoulds" in the standards themselves, the rationale has numerous “shoulds,” which make the exact requirements and goal of the standards somewhat unclear.

BAP: *The rationale and the standards have been modified to reduce this source of potential subjectivity.*

We appreciate the opportunity to comment and will be monitoring further developments of this standard. We sincerely hope to be able to comment on a second version. Please find our specific comments on the standards below.

Plan for Continuous Improvement
The idea of continuous improvement is articulated in several places, but the current plan appears weak. While we appreciate the idea of a “database that will allow salmon farmers, and eventually farmers of other species, to submit data anonymously on certain aspects of their operations for which evaluation by scientists might lead to better future standards,” there are no serious commitments to continuous improvement articulated in the document. Once again, we see this as a critical part of continuously improving the industry and making it more socially and environmentally responsible over time.

BAP: *BAP standards are regularly revised and improved. This is a key job of the technical committees and Standards Oversight Committee (SOC). For example, at the next SOC meeting, a set of improvements for existing farm standards (shrimp, tilapia, catfish, Pangasius) will be tabled for approval. The standards development process is documented in http://www.gaalliance.org/cmsAdmin/uploads/BAP-Proc.pdf.*

In the salmon standards, continuous improvement is illustrated by the requirement for a lower FIFO ratio in 2016. The database will guide continuous improvement in other areas.

Community Protection
We believe the community protection standards are far too weak to be classified as “responsible.” Most importantly, there is no mention of First Nations issues, nor are there standards to address them (traditional land use and culturally appropriate consultation and conflict management). These issues must be addressed for any farm considering certification in British Columbia, Canada, and could be relevant in New Zealand and other areas, as well. Finally, “reasonable complaints” need a clear and justified definition in order to be meaningful.

BAP: *Standard 2 has been strengthened. Native people are now mentioned in 2.5, and conflict management is required in 2.3 and 2.5.*
2.3: The applicant shall demonstrate interaction with the local community to avoid or resolve conflicts through meetings, committees, correspondence, service projects or other activities, with meetings conducted annually or more often.
2.4: The applicant shall record, review and respond helpfully to requests for information received from the public including sharing of non-proprietary farm data and to reasonable complaints, i.e., those that are specific to the applicant's operation and provide details in writing of the alleged failing.
2.5 Where applicable, the applicant must demonstrate dialogue with local native peoples and a process for conflict resolution with them under the laws governing their rights.

Sediment and Water Quality
These standards allow for “allowable benthic impacts” but appear to not define the allowable impacts and instead prescribe a system for monitoring the impacts. We would suggest that a clearer articulation of the “allowable impacts” is needed, along with metrics-based standards so that the acceptable level of impact is clear.

Furthermore, the credibility of the standard is questionable when all references sited are from government sources , and the standards rely on approval by these regulators. Governments are not credible sources for information on this issue and cannot be counted on to protect the environment to the extent that is required by a credible ecolabel. At a minimum, another independent source is required for reviewing the sediment sampling and analysis (4.4).

BAP: *There are good reasons to avoid the temptation (at this stage) to create a global, metrics-based standard for sediment quality that can be usefully applied in the 12 countries where salmon are farmed. This view has been expressed by, among others, Dr. Jack Rensel in his public comments.*

The salmon technical committee favors the route of gathering information through the BAP database before presuming that it can improve on locally designed monitoring programs. All the same, the BAP requirements for sediment quality monitoring are clearly laid out, and they have significant implications for areas with or without existing regulations.

Fishmeal and Fish Oil
We do not agree that a fish in:fish out of 2.5 is a responsible standard. The industry is touting a global average for FIFO of 1.2, therefore this standard in no way encourages improved performance, especially given that the calculations allow for fishery and aquaculture by-products to be excluded.

BAP: *To respond to concerns that 2.5 is too high, the FIFO limit has been reduced to 2.0 and will fall to 1.5 in 2016. When industry claims a FIFO of 1.2, this is usually calculated only on the basis of fishmeal. Using the IFFO calculation method (which BAP uses and which includes fish oil as well as fishmeal), there are very few farms that can attain a FIFO as low as 1.2. The Salmon Aquaculture Dialogues draft standard sets the FIFO limit at the equivalent 1.6 (although it uses a different calculation method and sets different metrics).*

The requirements related to the source of the fishmeal and oil are weak and would allow for up to 50% of the FM and FO used in the production of salmon certified by GAA as “responsible” could come from overfished, unsustainable, and even illegal fisheries. Furthermore, under the GAA feed mill standards, the requirements related to the sustainability source of the fishmeal (FM) and oil (FO) are unacceptable because feed mills can use FM and FO from any source until 2015, including fisheries known to be overfished and illegally caught fish, as long as the feed mill has a plan to try to avoid illegal and overfished sources.

After 2015, the standards require that only 50% of FM and FO be certified by either the MSC or IFFO, the latter of which is primarily focused on traceability rather than sustainability of the source. There appears to be no requirement for the other 50% of the FM and FO except that they fall under a plan to avoid illegal or endangered stocks. For a standard that intends to promote environmentally and socially responsible practices, the impact of feed ingredients must be more seriously addressed to reduce the dependence on wild fish and create incentives for continuous improvement over time.

The standards as currently written are weak in terms of definitions -- “sustainable fisheries” is not defined in the preamble and is not required in the standards, the implementation time of three years to meet the feed mill standards is too long, and the traceability requirements too low.

BAP: *For global consistency on this critical issue, the BAP feed mill standards apply to any feed mill, whether it supplies feeds for salmon, shrimp, tilapia or other aquatic species. The notion that achieving a target of 50% certified fishmeal and fish oil is inadequate simply reflects a Western bias. Achieving certification of 50% of fishmeal and fish oil in Asia (the center of gravity of the aquaculture industry) would represent a major achievement in promoting sustainable fisheries in that region.*

The characterization of the IFFO Responsible Supply standard as “primarily focused on traceability” is incorrect. Crucially, it incorporates the key components of the FAO Code of Conduct for Responsible Fisheries. Please refer to the standard, which can be obtained at http://www.iffo.net/default.asp?contentID=636.

Escapes
Under these standards, farmers would be allowed two escape events as high as 9.9% and no restriction on escapes of 0.4% or less. Assuming a farm can hold upwards of 1,000,000 fish, that could result in 198,000 escapes from one certified farm site in one cycle. This is not “responsible production” and, therefore, we refer to our initial comment about messaging these standards as "improved production" but not "responsible production."

For standard 6.6, how will “located within an area designated as ‘critical’ or ‘sensitive’ habitat (or equivalent terminology) with respect to wild salmon” be defined in a credible and scientifically robust way? Furthermore, how will “site-specific, valid documentation authorizing an exemption can be provided” be defined?

We would suggest again that a government-authorized exemption is simply not credible given their track record of poor management on this issue. An exemption in our view could only be credible based on an environmental impact assessment done by independent scientists who are experts in wild salmon population biology.

BAP: *The escapes standard has been rewritten with percentages replaced by numbers. The Implementation Guidelines now specify:*

- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with BAP being notified accordingly.*
- *In both cases, reinstatement of BAP certification following such escapes shall be subject to an independent engineering and operational review and risk assessment to determine the cause or causes of escapes, and to recommend corrective action where these are matters that the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that such corrective action has been taken.*

Predator and Wildlife Interactions
Standard 7.2 is unacceptable in its current form, given that the standard creates the possibility for the killing of IUCN red-listed species if permission is granted by the regulator. Once again, the regulator is not a credible source on this issue and cannot be relied upon to assess whether species can be killed. Furthermore, any killing of IUCN red-listed species is unacceptable, and any farm that conducts such activities must be removed from the certification scheme immediately. There is no justification for this in our view.

BAP: *The Implementation Guidelines qualify regulatory approval with an example as follows: “Procedures that make it clear that deliberate lethal controls on species classified as endangered or threatened are not to be used except under exceptional circumstances, such as risk to human life, and then only after specific written authorization is obtained from the regulator.”*

We disagree that there can never be justification for such action. Humane killing of an injured animal might be another circumstance.

There also needs to be a cap for the killing of predators (not IUCN red-listed), as any farm that continually kills animals, regardless of the reasons, must not be eligible for certification.

BAP: *We believe that the reporting requirements for lethal deterrence will expose continuous killing of predators, for which either good reasons will be presented to the auditor or the farm will fail the audit.*

Storage and Disposal of Farm Supplies
We do not believe that this use of copper-treated nets is “responsible production,” and the industry needs to find ways to move away from this method, especially with the existence and current use of net cleaners.

BAP: *The industry does need to improve in this regard. Requirements have been changed. The standard now specifies:*
8.10: If any farm nets are treated with copper or other toxicant-based antifouling materials, cleaning procedures shall collect, treat and dispose of wash water in compliance with national regulations regarding collection, treatment and disposal of such toxic wastes.

8.11: In farms that are switching from use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ at the farm if the nets have first been cleaned ashore by approved methods (Standard 8.10) and not retreated before redeployment.
8.12: The applicant shall have a written waste reduction plan and be able to demonstrate compliance with it, including annual reduction by at least 20% in the use of toxicant-based antifoulants per ton of fish produced.

And the Implementation Guidelines note:
The use of toxicant-based antifoulants will no longer be allowed in BAP-certified farms once the utility of alternatives is full established. This will be a priority consideration at the first review of these BAPs.

Animal Health and Welfare
Biosecurity and Disease Management
The issue of disease transfer from salmon farms to wild salmonids is one of the most important local impacts of the salmon farming industry. The current draft relies only on government regulation and the use of veterinarians to address this issue. This is not “responsible production" and in our view does not even get rid of the worst actors, which is are our understanding of the scope of these standards.

As they stand, these standards will not reduce the current impact of salmon farming on wild salmonids. While we recognize the challenge of developing standards on this issue, the lack of acknowledgement of the farm wild disease interaction issue in the current draft is a serious credibility concern in our view.

BAP: *The BAP approach to disease management in salmon farms does strengthen the role of the fish health professional, and it requires commitment to creating and operating effective area management agreements. BAPs also audit against a Fish Health Management Plan, which is not done now, and there is provision for a second audit if the first one raises questions. There are specific requirements on sea lice. For example the Implementation Guidelines indicate:*

“Applicants must be able to demonstrate that AMA rules and sea lice management procedures have been written for the protection of wild salmon, as well as the farmed fish, and that they include monitoring of sea lice loads and the setting of treatment trigger thresholds that take into account key factors such as season, the life cycle stages of farmed and wild fish, and the specific characteristics of the area in question.”

Food Safety
Control of Residues and Contaminants
We suggest that excessive use of antibiotics are allowed under these standards, which is not responsible in our view. Responsible production would only allow antibiotics to be used as a very last resort.

BAP: *Responsible use of antibiotics has been defined by the World Veterinary Association, American Medical Veterinary Association and RUMA Alliance in Scotland -- all of which are referenced in the BAPs and serve as guidance for the fish health professional.*

Furthermore, we are also concerned that there are no minimum standards for heavy metals, therapeutants, or chemicals (including sulphides).

BAP: *The BAP standards promote the use of vaccines as an alternative to antibiotics:*
10.7: All smolts shall be free from diseases and parasites, and vaccinated against diseases for which effective vaccines are available prior to stocking.

All salmon from BAP-certified farms must pass through a BAP-certified processor, and the BAP processing standard covers the testing of finished products for therapeutants, pathogens and other chemicals, such as malachite green.

Manuel Alfredo Vera Leal
Independiete
Castro, Chile

Fishmeal and Fish Oil Conservation
Feed-Conversion Ratio: Equation 2
Text to change:
Equation 2:
Fish in:fish out ratio = Feed fish inclusion factor on feed (from manufacturer) x Feed-conversion ratio
Where feed fish inclusion factor = [level of fishmeal in diet (%) + Level of fish oil in diet (%)] / [Yield of fishmeal from wild fish (%)+ Yield of fish oil from wild fish (%)]
Proposed text:
Equation 2:
FIFO Rate = [(AFMC + AFOC) / (YFMW + YFOW)] * FCR
Donde: AFMC es Actual fishmeal consumtion from wild catch (%)
AFOC es Actual fish oil consumtion from wild catch (%)
YFMW es Yield of fishmeal from wild catch (22.5%)
YFOW es Yield of fish oil from wild catch (5%)

FCR es Feed Convertion Rate same as (5) equation 1.
AFMC = [AFC (LFMD) - RM (RLFMM) - RBP (RLFMBP)] / AFC
Donde: AFC es acumulated feed consumtion of the year class (mt)
LFMD es level of fishmeal in diet from wild catch (%)
RM es recovered mortality year class (mt)
RLFMM es recovery level of fishmeal from recovered mortality (%)
RBP es recovered biomass from processing (mt)
RLFMBP es recovery level of fishmeal in recovered biomass from processing (%)

AFOC = [AFC (LFOD) - RM (RLFOM) - RBP (RLFOBP)] / AFC
Sonde: AFC es acumulated feed consumtion of the year class (mt)
LFOD es level of fish oil in diet from wild catch (%)
RM es recovered mortality year class (mt)
RLFOM es recovery level of fish oil from recovered mortality (%)
RBP es recovered biomass from processing (mt)
RLFOBP es recovery level of fish oil in recovered biomass from proccesing (%)

Reason for change:
De la forma que esta aplicado:
1. Asume que la mortalidad y el recorte producto del proceso (cabeza, agallas, cola, esquelones, belly flaps, trimming, visceras) es basura y no tiene ningÃºn valor, que constituye una pÃ©rdida neta para el sistema y no tiene valor ecolÃ³gico entre otros, lo cual no es correcto.

Fundamento: En Chile, la mortalidad ensilada y todos los recortes producto del procesamiento del salmon, en estado fresco del dÃa, se destinan a plantas de reducciÃ³n a harina y aceite de salmon con rendimientos medios de 16% para harina de salmon y 18% para aceite de salmon, respectivamente, productos que son destinados a la fabricaciÃ³n de otros alimentos animales y consumo humano produciendo una importante recuperaciÃ³n de matÃ©rias primas y por lo tanto contribuyendo directamente a disminuir la presiÃ³n de captura sobre la pesca silvestre, debido a que sin Ã©sta fuente de abastecimiento de insumos marinos de alta calidad serÃan demandantes netos de insumos marinos producto de ella.

Con el alto grado de elaboraciÃ³n de la industria salmonera el rendimiento de producto elaborado es en promedio 55% por lo que por cada tonelada bruta de salmon destinado aproceso se recuperan 450 Kg de subproductos destinados a harina y aceite de salmon; para un peso de cosecha promedio de 4.5 Kg, con una mortalidad acumulada digamos de 10% y un peso medio de la misma de 1.5 Kg significa que por la misma tonelada bruta de salmon destinado a proceso se han recuperado 33 Kg de mortalidad fresca ensilada destinada a producciÃ³n de harina y aceite, durante su ciclo de cultivo.

En resumen, de cada tonelada bruta de salmon destinada a proceso pueden recuperarse en promedio, y en forma documentada, 483 Kg de biomasa destinada a produccion de harina y aceite de salmon.

2. El FIFO
Rate de IFFO es correcto pero solo aplicable a producciones acuÃcolas en donde no existe ningÃºn grado de recuperacion de las matÃ©rias primas crÃticas de origen marino que les dieron origen y que, por lo tanto, no implican una economÃa ecolÃ³gica sobre los recursos pelÃ¡gicos

Fundamento: Si cada tonelada bruta de salmon cultivado destinada a proceso produce 483 Kg de biomasa destinada a produccion de harina y aceite de salmon, con los rendimientos ya mencionados, se recuperan 77.28 Kg de harina de salmon y 86.94 Kg de aceite de salmon por tonelada bruta cosechada. Considerando que el factor mas critico en la pesca silvestre, ecologicamente hablando, es la produccion de aceite debido a su bajo rendimiento (5%), por cada tonelada bruta de salmÃ³n de cultivo destinado a proceso se produce una economÃa de 1.74 toneladas de pesca silvestre. Esta importante economÃa de recursos naturales no esta considerada en el modelo FIFO Rate de IFFO.

3. El FIFO
Rate tal como esta planteado tÃ¡citamente constituye una especie de sibsidio ecolÃ³gico de la Industria Salmonera a otros Ã¡mbitos productivos que tambiÃ©n son demandantes de insumos de origen marino, harina y/o aceite de pescado.

Fundamento: Supongamos una granja de camarones que reemplace un 10% del contenido de aceite de pescado en el alimento por aceite de salmon de cultivo; si para el calculo de su FIFO Rate se resta previamente el reemplazo, que deberia ser lo correcto, se estÃ¡ premiando la substitucion que implica una economia de pesca pelÃ¡gica; pero si a la industria salmonera que dio origen al aceite de salmon reemplazado por la granja camaronera no se le resta el aceite recuperado que permitio el reemplazo para el cÃ¡lculo de su FIFO Rate, entonces se esta castigando a la industria salmonera la cual en este caso estarÃa subsidiando ecologicamente a la camaronera.

Si por el contrario no se resta la substitucion de la camaronera ni la recuperacion de la salmonera para el calculo de sus respectivos FIFO Rate, entonces se estan aumentando artificialmente los FIFO Rate de ambas y por lo tanto tambiÃ©n sus impactos sobre los stocks de pesca salvaje. Como DeberÃa ser el FiFO Rate Para el salmon de cultivo:

FIFO Rate = [(AFMC + AFOC) / (YFMW + YFOW)] * FCR
Donde: AFMC es Actual fishmeal consumtion from wild catch (%)
AFOC es Actual fish oil consumtion from wild catch (%)
YFMW es Yield of fishmeal from wild catch (22.5%)
YFOW es Yield of fish oil from wild catch (5%)
FCR es Feed Convertion Rate same as (5) equation 1.

AFMC = [AFC (LFMD) - RM (RLFMM) - RBP (RLFMBP)] / AFC
Donde: AFC es acumulated feed consumtion of the year class (mt)
LFMD es level of fishmeal in diet from wild catch (%)
RM es recovered mortality year class (mt)
RLFMM es recovery level of fishmeal from recovered mortality (%)
RBP es recovered biomass from proccesing (mt)
RLFMBP es recovery level of fishmeal in recovered biomass from proccesing (%)

AFOC = [AFC (LFOD) - RM (RLFOM) - RBP (RLFOBP)] / AFC
Donde: AFC es acumulated feed consumtion of the year class (mt)
LFOD es level of fish oil in diet from wild catch (%)
RM es recovered mortality year class (mt)
RLFOM es recovery level of fish oil from recovered mortality (%)
RBP es recovered biomass from proccesing (mt)
RLFOBP es recovery level of fish oil in recovered biomass from proccesing (%)

For a feed 30% fishmeal and 20% fish oil and a year class with FCR = 1.25 and the figures mentioned above in (1):

FIFO Rate as in BAP Standards (5) equals 2.2727
FIFO Rate as suggested here equals 1.6757.

Standard Number: 5.5
Text to change: The facility shall calculate and achieve a final fish in:fish out ratio of 2.5 or less for the most recent year class harvested.

Proposed text: The facility shall record and document the recovered biomass from processing and mortality, its recovery yields (%) to salmon meal and salmon oil (%), and calculate and achieve a final fish in:fish out ratio of 2.5 or less for the most recent year class harvested.

Reason for change: Changes in Equation 2 (fish in:fish out ratio) in such a way to incorporate the recovered raw materials (salmon meal and salmon oil).

BAP: *Yes, your equations describe the best way of including recovered salmon meal and salmon oil in a modified version of the fish in:fish out ratio. In a full, nutrition-based systems analysis, your method would be superior. However, although your method is correct, it does not measure the same thing that the FIFO calculation attempts to measure.*

FIFO is designed to reveal, in simple biomass terms, the trade-off when wild, pelagic fish are transformed into farmed fish. FIFO simply tries to answer the question of how much edible wild fish does it take to "make" a unit weight of edible farmed fish?

Because FIFO compares the biomass of whole wild fish going into the system with the biomass of whole farmed fish coming out of the system, the processing methods or by-products of the farmed fish are simply not relevant. Presumably there is a range of processing options open for the original wild fish, too, but these are also irrelevant to the simple comparison that FIFO makes.

Your method includes a correction for the recovered and processed dead (pre-harvest) salmon, but these fish are not destined for direct human consumption, so they can't really be considered equivalent to freshly caught wild fish, which could (in theory if not in practice) go for direct human consumption.

Department of Fisheries and Oceans

Ottawa, Ontario, Canada

Introduction – "BAP Standards"
The introduction does not make reference to the FAO Guidelines on Aquaculture Certification. The FAO guidelines have standards for all aspects of the draft BAP standards. BAP standards should make reference to the FAO Guidelines on Aquaculture Certification.

The statement: "To obtain BAP certification, applicants must be audited by an independent, BAP-approved certification body" is not consistent with the FAO Guidelines on Aquaculture Certification. According to the FAO Guidelines on Aquaculture Certification, all certifiers must be independently accredited by an accreditation body, not by the body of the certification scheme itself.

BAP: *Agreed. The introduction now states: Adoption of BAP standards is voluntary and market driven. Compliance with the BAP standards is audited by ISO-accredited certification bodies. Certified facilities may use the "Best Aquaculture Practices Certified" mark on retail packaging to alert consumers to compliance with BAP standards.*

3.3. This requirement could run counter to local/national laws on labor, especially regarding children working for family-run operations. The FAO Guidelines on Aquaculture Certification are not this specific. This also might be contrary to International Labour Organization (ILO) rules.
BAP standards should be consistent with the FAO Guidelines on Aquaculture Certification, and to ILO rules.

BAP: *Agreed. Standard modified:*
3.3: The applicant shall have a verifiable employment policy written in the employees' predominant language that bans forced and bonded labor, and child labor shall never be used outside the existing ILO conventions and standards.

4. AMBI indices have not been established for many oceanographic settings in Canada. Eliminate the requirement for biotic indexes where the use of a chemical proxy, such as sulphides and redox, has been established.

BAP: *Agreed.The standard has been modified accordingly.*

4. The explanation for the sediment and water quality standard is incomplete. as standards are also required within the zone of impact. The comment "Do not have significant negative impacts on sediment quality outside a defined sediment impact zone?" should be reworded. Areas both within and outside the zone of impact should meet applicable national and regional guidelines.

4. We strongly support the establishment of an international monitoring protocol. This is a necessary element of any scientifically defensible and adaptive standard. Maintain the statement below in the document:
"To help move the salmon industry toward a single, widely accepted, globally applicable protocol for such monitoring, farms will in the future be asked to submit sediment-monitoring data in a standardized format to a BAP database so that researchers can evaluate the desirability of such a protocol."

BAP: *In addition, the standard now notes:*
It is expected that an ISO standard for Environmental monitoring of the seabed impacts from marine finfish farms, [ISO/TC 234/SC N 85 -- ISO/CD 12878] will be finalized within two years when, it may be appropriate to require its protocols for this BAP standard. This will be kept under review by GAA, and the above requirements shall apply in the meantime.

4. "Existing farms shall provide at least three years of monitoring data to show that the farm meets or exceeds benthic standards required by its operating permits at current production levels."
We support the requirement of long-term monitoring and baseline data to support decision making. However, the statement requires clarification.

Does it mean within three years of application for certification? If required prior to certification, then existing farms in areas that do not require such monitoring will not be able to be certified until they have acquired three years' of sediment-monitoring data. Clarify requirement.

BAP: *Agreed. The requirement is now clarified, and the Implementation Guidelines state:*
Except in situations where sediment monitoring is not required and/or where an allowed sediment impact zone is not defined, provisions for which are made below, all applicants for BAP certification shall:
- *Provide documents that describe local standards for benthic impacts under salmon farms.*
- *Existing farms shall provide at least three years of monitoring data to show that the farm meets or exceeds benthic standards required by its operating permits at current production levels.*

4.2. Extensive benthic surveys to establish baseline species diversity index in virgin site would be cost prohibitive for small farms (given the need for expensive sampling equipment and expertise required to identify benthic species). For a preexisting farm, how does the farm establish a baseline, as the bottom has already been affected by the culture operation?

Measurement of a biotic index requires standardized invertebrate identification processes and trained personnel. Where these may exist, the numbers of such personnel available are likely to be few and costs per sample high. Chemical proxies for the benthic sediment condition (such as sulfides or redox) have been created and can act as proxies for biotic diversity indexes.

AMBI Indices have not been established for many oceanographic settings in Canada. What about indicators and standards for hard-bottom or mixed-bottom settings?

Remove the need for a species diversity index such as AMBI. Sediment chemical measures, such as sulphides and redox, have been established as an effective proxy of benthic impact on biotic diversity.

BAP: *Agreed. Standard modified accordingly.*

4.2. If local protocols do not require monitoring for organic accumulation and biological diversity, is this requirement still necessary? By which standard protocols shall this be monitored? Reconsider requirement.

Genetically Modified Salmon
Good clear standard. Maintain standard.

Escape Prevention
"A classification of the farm site based on expected maximum wave heights and currents using the method proposed in ISO 234/N029 or equivalent." The proposed ISO 234/N029 has been withdrawn. Reword bullet to read: "A classification of the farm site based on the standards that are being developed by ISO/TC 234"
At the end of Section 6, under "Additional Information," reference to ISO/TC 234 N029 Preliminary Work Proposal should be removed.

BAP: *Agreed. The requirement is now: A classification of the farm site based on expected wave heights and currents based on local estimates of 10- and 50-year maximum wind speeds and durations using the method proposed in NS9415 or equivalent.*

Escape Prevention
Net inspection procedures that ensure all operational nets are surface checked for holes at least weekly and checked sub-surface at least every four weeks. … Reword to bullet to indicate that net checks should be daily.

6.3. Is +/-2% technically feasible? Confirm feasibility.

BAP: *The inventory standard is now +/-3%, and more detail is given on the procedures:*
- *A certificate, signed by an authorized hatchery representative, shall accompany all shipments of juvenile fish (smolts) received that states how many fish there are in the shipment and the estimated margin of error in the count. The margin of error shall be verifiable by reference to documented hatchery procedures and records.*
- *A projection shall be prepared immediately after a year class of smolts is fully stocked of the number of fish expected to be harvested in each year class, based on the number of smolts received and taking into account the possible error in the hatchery count as well as other projected losses during the growth cycle.*
- *The above projection shall then be compared with the actual number harvested when harvesting of a year class is complete. Any variance shall be explained by reference to farm records of known losses. Variances greater than ± 3% that cannot be explained shall prompt a secondary audit investigation at the applicant's expense to try to determine the cause and, if a satisfactory explanation is not found, shall result in loss of BAP certification.*

9.3. Density requirement of 25 kg/m^3 is fine for cage sites, but what about land-based recirculating aquaculture systems, where rearing densities are much higher (i.e., 50 kg/m^3)? Define 25 kg/m^3 for cage culture only.

BAP: *The scope of the standards is cage farming only. This is explained in the preamble:*
The following Best Aquaculture Practices standards and Implementation Guidelines apply to the cage and net pen production of Atlantic salmon, Salmo salar*; Chinook salmon,* Onchorynchus tshawytscha*; coho salmon,* Onchorynchus kisutch*; and rainbow trout,* Onchorynchus mykiss*.*

Area Management Measures
Good standard. It acknowledges that as science and understanding changes, standards will be updated. Maintain standard.

This section has implications for governing bodies, and government resources will be required. Is this possible in all countries, or only in those that produce salmon? If only in some, this requirement is inequitable.

Good standard regarding requirement for fallowing and single year class. Maintain standard.

Marine Finfish Aquaculture Standards Project
Pew Environment Group

Christopher Mann and Rachel Hopkins
Philadelphia, Pennsylvania, USA

We appreciate this opportunity to comment on the Global Aquaculture Alliance's first draft of farmed salmon standards. Below, we have provided both broad recommendations related to the draft standards and standard-setting and certification process, in addition to more detailed comments related to the specific draft standards. Please note that these recommendations and comments do not imply endorsement by the Pew Environment Group of the draft or final standards.

General Recommendations:

1) Reposition the GAA salmon standards as standards that incentivize continuous improvement in performance, instead of standards that certify the performance to be "environmentally and socially responsible."

The language used by the Global Aquaculture Alliance (GAA) in written materials used to describe GAA-certified products seems to suggest that only those farms that are sustainable and among the top performers in the industry are awarded the GAA label. In other words, the description reads like a "gold" standard for aquaculture.

The first page of the draft salmon standards document ("Aquaculture Facility Certification: Salmon Farms, Best Aquaculture Practices -Certification Standards, Guidelines") states that: "[t]he Best Aquaculture Practices (BAP) program encompasses an international certification system that verifies environmentally and socially responsible processes under which fish, shrimp and other seafood are produced." The document further explains that: "[c]ertified facilities may use the 'Best Aquaculture Practices Certified' mark on retail packaging to reflect BAP participation.

The question that remains unclear is whether the GAA's goal is to certify a small percentage of producers that demonstrate environmentally and socially superior farming practices or whether the Alliance is instead focused on engaging the bulk of the industry in a continuous improvement program.

While the GAA label currently claims to certify "best" practices, several of the standards presented within this first draft of the farmed salmon standards document focus largely on data collection, compliance with national and local regulations, and continuous improvement instead of adherence to a set of consistent, rigorous performance-based environmental and social standards.

In a number of cases where standards are set, the draft standards fall short of verifying environmental responsibility (see specific comments below). This discrepancy between how the GAA positions its standards (e.g., "best" practices) and the potential scope and focus of the standards leaves the draft GAA salmon standards highly open to criticism.

To the average person, "best" implies the top-tier producers. At the very minimum, "best" does not imply producers that are worse than the average. If the GAA intends to certify a large percentage of the industry, be it 75 or 80 percent, it is misleading to claim that these are "best" practices or the top-tier producers.

At a time when a growing number of initiatives are attempting to define "sustainable" salmon aquaculture, the GAA's value seems to lie in its ability to engage a wide swath of the industry into a scheme that incentivizes continuous improvement of farming practices. Instead of competing with other initiatives attempting to certify the top tier of salmon producers, we encourage the GAA to instead reposition itself so that it is clear to all parties, especially buyers and consumers, that the GAA certification scheme does not highlight best practices or producers, but encourages better performance among those producers that elect to participate.

We believe that greater clarity and transparency regarding the GAA's objective and market representation would go a long way to reduce criticisms of this standards. We also believe it would allow the GAA to create a strong niche for itself and add value in the certification arena, especially in the areas of standardization of data and data collection, and the development of mechanisms to gauge and verify continuous improvement.

BAP: *We can certainly agree with your comment that the value of the BAP program lies "in its ability to engage a wide swath of the industry into a scheme that incentivizes continuous improvement of farming practices."*

We can also agree that there is plenty of room for other, more narrowly focused standards to set even higher bars on specific aspects, such as animal welfare or social and environmental issues. It is good for standards to address specific concerns like animal welfare (e.g., via the RSPCA's Freedom Foods standard). It is potentially even better to address multiple issues like social and environmental responsibility (e.g., via the Aquaculture Dialogues Standards), but we would argue that it's actually "best" to address all these concerns in one set of standards and to include food safety, too. Hence, the BAP claim to define "best" practices.

To help communicate this message, the introduction to the standard has been rewritten to provide clarity and background regarding the BAP program, its objectives and the standards development process.

2) Create a process that will lead to quantitative, performance-based standards, in which improvements in performance can be easily measured and verified. While we understand that the GAA's approach to certification is a stepwise process, we are not confident that the current GAA draft salmon standards document ensures that the process will move beyond simple legal compliance and data collection into the development of effective, performance-based standards for salmon aquaculture.

We do not support a certification scheme that rewards producers with an ecolabel simply for achieving legal compliance and collecting data, without a continuous improvement timeline and clear standards development and improvement process in place. Below, we offer a series of recommendations to strengthen the GAA certification process:

BAP: *The BAP standards go far beyond legal compliance, setting metrics for, amongst many things, fish in:fish out ratios, sustainable sourcing of fishmeal and fish oil, escapes and inventory standards, and they build upon existing regulations and regulatory compliance avoiding, where possible, unnecessary duplication of effort.*

A. Provide a clear description of the timeline and plan for a phased approach to produce informed, numerical standards for salmon aquaculture. There is repeated mention in the draft standards document of the development of a database, however no time frame is provided, and no deadlines are established within the draft standards themselves. Similarly, there is repeated mention of a focus on "continuous improvement," yet the current draft provides little detail regarding how the standards and certification process will be managed to ensure continuous improvement in performance of certified farms.

We strongly encourage the GAA to include a detailed outline of its strategy for translating collected data into meaningful, numerical standards that lead to continuous improvement among certified farms. Further, it should provide a timeline for each step of the process including database development, disclosure of data by BAP farms, and analysis of disclosed data, that results in the inclusion of quantitative, performance-based standards for all major environmental and social criteria within the next iteration of the salmon BAP standards. Mere data collection, without proper analysis and evaluation of performance, is not indicative of environmental or social responsibility.

BAP: *The commitment to continuous improvement in the salmon standards is explicitly stated, and the BAP program can be judged on its past record of continuous improvement with its other farm standards, all of which have, under the scrutiny of the SOC, undergone progressive improvements. Also, for the key issue of fishmeal and fish oil conservation, the tightening of the limit (from 2.0 to 1.5 in 2016) is built into the standards. Please also refer to the response to the GAPI appraisal to see how meeting BAP standards will improve a farm's GAPI score.*

B. Organize the database in such a way that enables consistent reporting and a comparison of performance among producers and over time. We understand that producers are already required to collect and supply a variety of data in a large array of formats by a number of entities, both government and private. We believe a database, like that proposed by the GAA within these standards, could help to serve as a model, and possibly harmonize, both the type of data collected and the format in which it is provided.

We encourage the GAA to explore the Global Aquaculture Performance Index (GAPI) out of University of Victoria as a model for the design of the database and guidance on the types of data most criticial for the development of meaningful standards for environmental performance. By establishing a database that is consistent with GAPI indicators and data, the GAA can take better advantage of the GAPI methodology as a tool to gauge and compare the environmental performance of its BAP-certified farms.

Additionally, the GAA should lead other standard-setting, regulatory and certification initiatives toward a more harmonized approach to data collection in aquaculture. This could significantly reduce costs to farms that are certified to multiple standards and process specs.

BAP: *Reaching a harmonized approach to data collection in aquaculture is a very worthwhile objective, and BAP can play a part through the database. As regards the GAPI framework, at this stage, the BAP program would not gather all the data needed to calculate values for all the indices. This does not mean that compliance with BAP will not lead to an improved GAPI score. The following is reproduced from the response to the GAPI appraisal of the draft salmon standard:*

The BAP Salmon standard has been modified in various ways that would improve the GAPI score of participating farms. GAPI has 10 dimensions. Taking them in turn:

1. (Antibiotic usage) The BAP salmon standard does not permit the use of banned antibiotics. In addition it promotes vaccination instead of antibiotic usage.

2. For copper antifoulants the following restrictions apply:
8.10: If any farm nets are treated with copper or other toxicant-based antifouling materials, cleaning procedures shall collect, treat and dispose of wash water in compliance with national regulations regarding collection, treatment and disposal of such toxic wastes.
8.11: In farms that are switching from use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ at the farm if the nets have first been cleaned ashore by approved methods (Standard 8.10) and not retreated before redeployment.
And the standard notes: The use of toxicant-based antifoulants will no longer be allowed in BAP-certified farms once the utility of alternatives is full established. This will be a priority consideration at the first review of these BAPs.

3. Regarding biochemical oxygen demand, BAP standard 4, covering sediment and water quality, specifies how any negative impacts of settled and dissolved wastes should be monitored and managed. This allows for a flexible response to local site-specific conditions to be applied and tackles actual impacts rather than theoretical organic loading.

4. Regarding capture-based aquaculture, the FIFO limit has been reduced from 2.5 to 2.0, and it will fall to 1.5 in 2016. The relevant clauses specify:
5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 2.0 or less for the most recent year class harvested.
5.6: (Future standard) After June 1, 2016, the facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested.

5. Similarly for ecological energy, the BAP standard applies downward pressure via the FIFO ratio.

6. For escapes, the standard now specifies an inventory standard (+/-3%) and limits escapes in terms of numbers of fish rather than percentages of fish:
6.6: The applicant shall provide documents to show that the variance between the projected and actual harvest numbers of fish from the last year class harvested was less than ± 3% after accounting for known losses.

And the Implementation Guidelines specify:
- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*

7. Industrial energy. The BAP salmon standards, via the FIFO limit, encourage the use of fishery by-product meals and oils rather than meals and oils derived from whole forage fish. If the Industrial energy inputs of the fishery are allocated to co-products on the basis of economic values rather than mass (which they should be), then the BAP FIFO limit will lead to reductions in this indicator ,too.

8. Parasiticides. The indicated GAPI formula for this refers to copper. See comments above on copper.

9. Pathogens. This indicator increases in response to the numbers of escaped fish, so the BAP provisions on escapes (see above) are relevant here.

10. Sustainability of feed. The BAP provisions on the sourcing of feeds containing certified fishmeal and fish oil have an impact on this indicator. The specific clauses (for which details are given in the Implementation Guidelines) are in the feed mill standard:
3.3: The applicant shall develop and implement a clear, written plan of action defining policies for responsibly sourcing fishmeal and fish oil.
3.4: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal and fish oil derived from reduction fisheries shall come from approved certified sources.
3.5: (Future critical standard.) After June 1, 2015, at least 50% of the fishmeal or fish oil derived from fishery by-products such as trimmings and offal shall come from approved certified sources.

C. Ensure that the database is made publicly available. If the community is to accept data collection in lieu of quantitative standards as the first phase of GAA certification, it is critical that the data collected can be accessed, utilized, and perhaps most importantly, scrutinized by all parties. The draft standards should describe, in detail, which information within the database will be made publically available. This database should be made available via a user-friendly public website.

We encourage the GAA to require that each certified farm disclose the following data. We acknowledge that the draft standards already require or at least encourage the collection of some of the data listed below; however, this more detailed list is based on the data requirements of the key environmental indicators as defined by GAPI. By requiring farms to provide data that parallels GAPI in both data type and data format (units), GAA would be able to immediately take advantage of GAPI as a tool to assess the performance of its farms and to track improvements and trends in performance over time.

BAP: *The intention is not to make the database publicly available. It will be available to selected scientists at the discretion of GAA and the SOC. Participating farms will contribute anonymously (unless they choose otherwise).*

Antibiotic Use
- Amount of active ingredient applied (kg) per year or per production cycle, or the dosage and total treatment days per production cycle
- Method of application (bath, in feed, etc.)
- Water quality (biochemical oxygen demand, BOD)
- Amount of C and N in feed
- Amount of C and N in fish
- Crude protein amount (or proportion) in feed and fish
- Number and location of other fish farms within 3 km of farm
- FCR (wet weight:wet weight)
- Proportion of pelleted versus raw fish in feed

Capture-based aquaculture
- Total weight (kg) of individuals removed from wild
- Wild survival rate of the seedstock
- Source fishery for seedstock

Antifoulant (copper)use
- Weight (kg) and type of antifoulant applied to nets and any other applications
- Number of applications per year (or production cycle)
-

Ecological energy (net primary productivity)
- Proportion of livestock, plant and fish feed components
- Respective livestock, plant and fish species used in feed components
- The transfer coefficient for livestock and plant components, if available
- Feed-conversion ratio (FCR)

Escapes
- Number of escapes
- Average weight (kg) at time of escape
- Number of escape events per production cycle
- Number of fish unaccounted for (unknown losses)
- Percent of production that is in closed containment

Feed sustainability
- Species and source fishery of each fish species included in feed
- Marine inclusion -- proportion of feed that that each fish species comprises
- Fish oil (FO) and fishmeal (FM) yield ratios for each species

Industrial energy
- Proportion of livestock, plant and fish feed components
- Respective plant and livestock species used in components
- Type and amount of energy (kJ) required for feed production, broken down by feed component and production system

Parasiticides
- Weight (kg) of active ingredient applied per year or per production cycle or the dosage and total treatment days per production cycle
- Material safety data sheet (MSDS) information for all parasiticides applied
- Method of application

Pathogens
- Total production loss on farm (mt) from diseases or parasites
- Production loss (mt) attributed to each disease or parasiteor relative pathogenicity of each disease or parasite

BAP: *Please refer to the GAPI response given above.*

3) In the absence of data or clear scientific consensus, where there is sufficient risk of ecological harm, incorporate risk-based or precautionary standards into current standards. While the goal of any standard-setting initiative should be to develop standards that track performance or impacts in the water, in several cases, there are presently no feasible and credible methods to determine particular effects of fish farming on the environment.

Take, for example, disease transmission and escape episodes -- two areas where there is large agreement that ecological harm can result but little consensus on how these potential threats should be incorporated into standards.

One approach is to simply not establish a standard for these impact areas until credible and feasible methods of quantifying these impacts are available. However, where there is sufficient scientific information or expert opinion to suggest that a circumstance could lead to significant environmental harm, it is negligent to simply ignore the issue.

Instead, we strongly encourage the GAA adopt a risk-based approach in these cases. For instance, the current draft lacks a standard that controls for or at least mitigates the risk of introduction of non-native species. This must be addressed in the final standard.

BAP: *The standard now states for non-native species:*
Introductions of species of salmon to countries where such species are either not native or not already farmed shall be subject to the provisions of the ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2005.

The GAPI methodology provides a simple, yet robust approach to incorporating measurements of risk into environmental performance indicators. Specifically, GAPI's disease and escapes indicators combine elements of performance (e.g., number of escapes) with a measure of risk (e.g., risk of invasiveness of the species in the particular environment) to provide a more finely calibrated measure of the effects of these occurrences.

We encourage the GAA could use models like GAPI in designing disease and escapes standards that incorporate these important elements of ecological risk, while still meeting the goal that its standards are achievable.

4) Strengthen standards related to Area Management Agreements (AMAs). We commend the GAA for attempting to address some of the aggregate impacts of salmon farming through the development of Area Management Agreements (AMAs). We believe this is a critical focus for any initiative working to define and certify sustainable aquaculture and yet, a component that is absent from other standards to date.

While the narrative includes a requirement for BAP farms to work within an AMA, the relevant language in the standards section only seems to indicate that farms should be working toward an AMA. While the GAA cannot dictate the actions of non BAP-certified farms, it has a unique opportunity to mandate the immediate participation of BAP-certified farms in AMAs.

As such, we encourage GAA to strengthen this standard so that BAP-certified farms are required to initiate new AMAs were they don't presently exist and immediately participate in AMAs were they have already been established. Additionally, the AMA language should be integrated throughout the standards, where appropriate. Presently, it does not appear until Standard 10.

BAP: *Agreed. AMAs are now introduced in Section 2 and referenced in Sections 4 and 10. There is a requirement to either join or set up an AMA.*

5) Include additional standards that control for the impacts of smolt production. It appears that the GAA plans to rely on separate hatchery standards to address the environmental impacts of smolt production related to salmon aquaculture. However, GAA hatchery standards do not yet exist. Given smolt production can result in substantial environmental impacts, It is critical that the current standard contain smolt production standards unless and until separate smolt production standards are adopted.

BAP: *The next project for the salmon technical committee will include smolt standards.*

6) Ensure that all requirements mentioned within the narrative sections of the draft salmon standards are incorporated into the actual standard. There are a number of strong requirements in the draft narrative that are not repeated in the binding, standards sections of the draft. For instance, in Principle 5, the narrative mandates that farms source from certified feed mills within three years of certification, but this requirement is not incorporated into an actual standard. In Principle 11, withdrawal timelines following drug treatments are only listed in the narrative, not a standard. It is important that withdrawal times are included within the standards section, as well.

BAP: *Agreed. The requirement is now for sourcing from a BAP-certified feed mill or from sources that meet the fishmeal and fish oil conservation component of the feed mill standards. This component is now appended to the standards.*

7) Host a second public comment period. We understand that GAA's BAP is seeking ISO 65 compliance, not ISEAL accreditation, and thus, is only required to provide one, 60-day comment period. While we appreciate the extension of this first comment period, a second public comment period on revised standards would lend greater credibility to what is likely to be a controversial standard.

Given the first public comment period is likely to result in substantial comments to and revisions by the GAA committees, a second review period is warranted. This second review period also provides members of the community with the opportunity to understand how their concerns may have been considered and incorporated.

BAP: *The documented procedures for the development of BAP standards (http://www.gaalliance.org/cmsAdmin/uploads/BAP-Proc.pdf) neither require nor prevent a second public comment period. Whether one is held is at the discretion of the Standards Oversight Committee. Please note also that the ISEAL code does permit a single comment period when a standard is urgently needed.*

Comments on Specific Environmental Performance Standards:
Below, we have provided more detailed comments on those draft performance standards that specifically relate to environmental impacts, as this is our area of expertise. We have focused our comments on those areas we believe need the most attention and strengthening at this stage.

Environment: Sediment and Water Quality

- This section is focused on monitoring and data collection versus actual performance standards. Without the inclusion of science-based, performance standards that minimize the impact of BAP farms, we cannot support the claim that these standards certify "environmentally responsible" or "best" practices.
- Since legal requirements can vary drastically from region to region, by deferring to legal requirements, this standard does not provide a clear, baseline level of performance. At a minimum, actual monitoring standards and data collection and verification requirements must be clearly defined in the standard.
- As stated earlier, participation in Area Management Agreements (AMAs) that include coordination on sediment and water quality should be mandatory for all BAP farms (see Standard 4.6).
- We support the requirement in Standard 4.5 to collect data on C and N discharges, which can be used to calculate the biochemical oxygen demand (BOD) of each BAP farm site. Given the variation between sites and their ability to assimilate different types, concentrations and quantities of discharge, we support the use of BOD as an efficient, yet dependable measure of the impacts of nutrient discharges on water quality.

BAP: *There are good reasons to avoid the temptation (at this stage) to create a global, metrics-based standard for sediment quality that can be usefully applied in the 12 countries where salmon are farmed. This view has been expressed by, among others, Dr. Jack Rensell in his public comments.*

The salmon technical committee favors the route of gathering information through the BAP database before presuming that it can improve on locally designed monitoring programs. All the same, the BAP requirements for sediment quality monitoring are clearly laid out, and they have significant implications for areas with or without existing regulations.

Environment: Fishmeal and Fish Oil Conservation

- This section largely defers to the separate GAA feed mill standards for sustainable sourcing requirements, thus making it difficult to evaluate and comment upon the strength of the marine feed ingredient standards as a whole.
- This standards section should repeat the requirement (mentioned in the narrative) that BAP-certified salmon farms will be required to use only feed from certified feed mills within three years of the implementation. That said, if a farm is to be awarded a label that denotes "environmentally responsible" practices or "best" practices, it should be required to use only sustainably sourced feed at the time of certification.

BAP: *The requirement is now for sourcing from a BAP-certified feed mill or from sources that meet the fishmeal and fish oil conservation component of the feed mill standards.*

- Standard 5.5 caps the fish in:fish out ratio (FIFO) at 2.5. Using the fishmeal and oil yield rates stated in GAA's feed mill standards and assuming an FCR of 1, this suggests that BAP-certified farms could use feed that has a combined meal and oil inclusion rate of 75%. This standard is not aligned with "best" practices in the industry.

  According to the International Fishmeal and Fish Oil Organisation (IFFO), the FIFO for farmed salmon was 1.7:1 in 2008 (http://www.iffo.net/default.asp?contentID=730). Given rapid advancements in the use of alternative feeds, we expect that the average FIFO for farmed salmon could be well below 1.7:1 currently.
- We encourage GAA to strengthen the standard so that the allowable FIFO ratio encourages continued substitution of fishmeal and fish oil with alternative, sustainable feed sources and is more

closely aligned with “best” practices. At a minimum, this suggests that the FIFO should be lower 1.7:1, the 2008 global average for salmon.

BAP: *Agreed. The FIFO limit has been reduced to 2.0 and will fall to 1.5 in 2016.*

Environment: Control of Escapes

- Regarding Standards 6.1 and 6.2, while escape prevention practices and a containment plan may serve to reduce escapes, the plan in itself does not standardize or limit the actual impact on the water. We encourage the GAA to adopt escapes standards that are measurable and performance-based.
- Standard 6.3, referring to the control of “leakage”, allows for a margin of error of +/- 2% after the count from the hatchery. This standard is unclear and should be reworded. The intent could be to limit the uncertainty in the counts due to mechanical error and leakage to 2%, or it could be to allow for an additional 2% leakage beyond the mechanical error in the counts from the hatchery. Additionally, for comparison, Salmon Aquaculture Dialogue’s draft farmed salmon standards set total “leakage” at 0.1% including mechanical error.
- We are concerned that Standards 6.4 and 6.5, which focus on catastrophic loss, may inadvertently allow for the certification of farms that report escapes that are significantly higher than the industry average.

  Standard 6.4 requires farms to demonstrate that there “have not been three or more escape events of 0.5% or more of the farm’s total inventory during the last two production cycles.” Standard 6.5 sets a cap on escapes at less than 10% per single episode. As currently written, these standards would allow a BAP-certified farm to experience two escape episodes in one production cycle that each result in escapes of 9.9% of total inventory or a combined total of 19.8% of total inventory. Assuming a farm’s inventory can be upwards of one million fish, a farm could report 198,000 escapes and still be certified under this standard.

  As a comparison, data from the Department of Fisheries and Oceans Canada indicates that a total of 215,642 Atlantic salmon escaped from all farm sites combined in 2007 (http://www.al.gov.bc.ca/fisheries/). With approximately 255 farm sites in operation that year, Canada reported an average of 846 escaped Atlantic salmon per farm site. In the same period, the U.K. reported 239,168 escapees of Atlantic salmon from 210 farm sites (U.K.: Fisheries Research Service 2007) or approximately 1,130 escapes per site. Data provided by Norwegian salmon farms, which experienced relatively significant escapes in 2007, suggest an average of approximately 2,000 escapes per farm site in 2007 (http://www.ssb.no/english/subjects/10/05/nos_fiskeoppdrett_en/nos_d401_en/tab/2-6.html).

  Yet, the draft GAA standard would allow for one certified “environmentally responsible” farm site to report 198,000 escaped fish in one production cycle. Thus, the GAA standards are much weaker than standard industry performance.

- For this first version of the GAA salmon standards, we highly suggest the GAA review escapes data for recent years and, at a minimum, set the standard to a level that lies within at least the top quadrant (top 25%) of farm performance for escapes. Additionally, the standards should immediately require that any escape episode above 0.5% of total farm inventory cannot be the result of human/operator error.
- As a goal for the next iteration of the standard, we encourage the GAA to base its escapes standard on actual impacts on the marine environment versus simply setting a percentage threshold across the industry, irrespective of the biological context in which the farms are sited.

  As mentioned in the general comments section, given the risk component related to escapes of farmed fish in the marine environment, we suggest future standards incorporate risk-based standards, as well. The GAPI project has designed an escapes indicator that includes a detailed risk assessment survey that could be easily incorporated into a future iteration of this standard.

BAP: *Responding to comments that an escape standard based on percentages is inappropriate, the standard has been tightened by setting numerical limits on a per-cage basis as well as mandatory counts if an escape is suspected in a cage. Thus the Implementation Guidelines now specify:*

- *BAP certification shall be suspended if three or more escapes of more than 500 fish from individual cages are documented over two consecutive production cycles, or if such escapes cumulatively exceed 5,000 fish.*
- *BAP certification shall also be suspended if there is a single escape of more than 5,000 fish at any time, which shall be reported immediately to the regulator with GAA being notified accordingly.*

The inventory standard has also been reworded and the Implementation Guidelines specify:
- *A certificate, signed by an authorized hatchery representative, shall accompany all shipments of juvenile fish (smolts) received that states how many fish there are in the shipment and the estimated margin of error in the count. The margin of error shall be verifiable by reference to documented hatchery procedures and records.*
- *A projection shall be prepared immediately after a year class of smolts is fully stocked of the number of fish expected to be harvested in each year class, based on the number of smolts received and taking into account the possible error in the hatchery count as well as other projected losses during the growth cycle.*
- *The above projection shall then be compared with the actual number harvested when harvesting of a year class is complete. Any variance shall be explained by reference to farm records of known losses. Variances greater than ± 3% that cannot be explained shall prompt a secondary audit investigation at the applicant's expense to try to determine the cause and, if a satisfactory explanation is not found, shall result in loss of BAP certification.*

- We support Standard 6.6 that states that a farm cannot be located in a sensitive habitat. However, we encourage the GAA to remove the clause "unless site-specific, valid documentation authorizing an exemption can be provided," as this invalidates the standard.

BAP: *It does not invalidate it. It simply provides for exceptions, which there may be but which we cannot possibly know about in sufficient detail.*

If the GAA intends to allow for any exemptions, at a minimum, the exemptions should be based on an Environmental Impact Statement performed by independent accredited scientists as per standard protocols with the results publicly available for review and verification.

BAP: *The standard has now been modified:*
6.7: The farm shall not be located within an area officially designated as "critical" or "sensitive" habitat (or equivalent terminology) with respect to wild salmon unless site-specific, valid, official documentation, supported by an environmental impact analysis, authorizing an exemption can be provided.

- Additionally, "critical" and "sensitive" habitats or similar terminology need to be further defined before the second comment period.
- This draft lacks any restrictions on introductions of non-native or invasive species. The final GAA standard must address this impact (see "general comments" for further recommendations).

BAP: *For non-native species, the Implementation Guidelines now specify:*
Introductions of species of salmon to countries where such species are either not native or not already farmed shall be subject to the provisions of the ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2005.

Environment: Storage and Disposal of Farm Supplies
Our primary concern related to this principle is the use of copper-based antifoulants. According to Chou et al, (2002), copper in excess of the recommended maximum concerns has been found at aquaculture facilities and can remain biologically active, and potentially lethal to marine organisms, when bound in marine sediments.

While this section requires that farmers clean treated nets on land and collect wash water in compliance with national laws, it does not actually place any restrictions on the use of copper-based antifoulants. If the first iteration of the GAA standards is intended to focus on data collection and certified farms will not be marketed as "environmentally responsible," then at a minimum, the GAA standards should require both reporting on antifoulant use and also monitoring of marine impacts related use of copper. If the standards are intended to certify a farm as "best" practices immediately, it should not certify any farm that treats its nets with copper-based antifoulants.

BAP: *Although not meeting all your concerns, the Implementation Guidelines now specify that the farm must have a waste disposal plan with:*

- *Procedures for washing nets treated with copper or other toxicant-based antifouling materials. Nets treated with antifloulant that is deemed to be toxic, such as cooper, shall be cleaned out of the water at a licensed off-farm net-cleaning establishment, or on the farm if equipment and procedures are in place to treat the wash water and collect the solid waste before disposal. In all cases, methods of collection and treatment shall comply with national or regional regulations governing the disposal of toxic wastes.*

And a waste reduction plan is also required:
The waste reduction plan shall include a program to test mechanical in situ net cleaning systems as their practicality is proved and shall demonstrate diminishing use of toxicant-based antifoulants over time.

And the Implementation Guidelines note:
The use of toxicant-based antifoulants will no longer be allowed in BAP certified farms once the utility of alternatives is full established. This will be a priority consideration at the first review of these BAPs.
The standards clauses are:
8.10: If any farm nets are treated with copper or other toxicant-based antifouling materials, cleaning procedures shall collect, treat and dispose of wash water in compliance with national regulations regarding collection, treatment and disposal of such toxic wastes.
8.11: In farms that are switching from use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ at the farm if the nets have first been cleaned ashore by approved methods (Standard 8.10) and not retreated before redeployment.

Biosecurity and Disease
Given the issue of pathogen transfer between salmon farms and wild salmonids is one of biologically important and contentious issues related to salmon aquaculture, a rigorous, science-based pathogens standard is especially critical to ensuring the credibility of these standards. The draft GAA standards, however, rely solely on national regulations and veterinary expertise to manage on-farm pathogens. This lack of actual performance-based standards for pathogens could lead to vastly different impacts of certified farms depending upon the country in which they operate.

If the GAA intends to market this as ”best” practices salmon aquaculture, we encourage it to revisit this section and incorporate a set of strong, performance-based standards that minimize the impacts and risks of both the transfer of pathogens to wild fish and of the chemical treatments used and discharged.

Any revised standard must include standards that address the impacts of sea lice on wild fish populations. Prophylactic use of antibiotics should be explicitly banned, beyond the requirements included in Standard 10.8.

The GAA should consider banning the use of antibiotics considered critically important for human and veterinary health according to the WHO-OIE ranking system. The WWF-coordinated Salmon Aquaculture Dialogue (SAD) draft standards include a similar requirement. Further, the requirement that veterinarians balance environmental, human health and animal health risks appears only in the narrative. It should also be incorporated in the actual standards.

We support the portion of the standards that requires farmers to alert certifiers to changes in its fish health professional as a means to prevent “shopping” for more lenient fish health professionals. We also support Standard 10.13, which requires farms to accept that auditors can seek second opinions if they are concerned about how the FMP is written or implemented.

We strongly support the sentiment of Standard 10.11. However, we encourage the GAA to require farms to coordinate with all other BAP-certified farms in Area Management Agreements immediately. The present standard only requires farms to “work toward the establishment and implementation” of AMAs and sets no timeline for actual coordination within AMAs related to disease management.