Salmon Aquaculture Dialogue
Bergen, Norway
November 17-18, 2009

Meeting Summary

Prepared by World Wildlife Fund and Consensus Building Institute on behalf of the Salmon Aquaculture Dialogue Steering Committee
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Meeting Background

The Salmon Aquaculture Dialogue met November 17-18, 2009 in Bergen, Norway to discuss draft environmental indicators for responsible salmon production. This was the 14th public Dialogue meeting since the process began in 2004. The expected outcomes of the meeting were to:

1) Update stakeholders on the Salmon Aquaculture Dialogue, ensuring participants understand the Dialogue process, work completed to date, timeline, and goals, as well as the important role of participants and means of participation.

2) Collect constructive feedback from meeting participants on draft indicators. Specifically, determine whether the suite of draft indicators sufficiently address participants' "big picture" of key potential impacts from salmon farming and request concrete suggestions for ideas (for indicators, data sources, or other) to be used to revise the draft indicators.

Please note that all documents and presentations referred to in this meeting summary are available on the Salmon Aquaculture Dialogue (SAD) website:

http://www.worldwildlife.org/salmondialogue

The meeting agenda is attached as Annex I.

Key Meeting Outputs

- Provided an overview of the Salmon Aquaculture Dialogue's purpose, process and achievements to date.
- Received participant feedback on goals, objectives and work to date of the Dialogue. In particular, received extensive suggestions for improving draft indicators released prior to the meeting.

Pre-Meeting Outreach

In anticipation of this meeting, the Dialogue coordinator and steering committee members communicated with a broad range of stakeholders in Europe and around the world to encourage their participation in the meeting. The Dialogue also published public notices about the November meeting in trade publications and on the Dialogue's website. The Dialogue used its 700-member e-mail list to inform stakeholders about the meeting.

Meeting Participants

More than 90 people participated in the meeting, representing NGOs, governments, trade bodies/industry associations, salmon producers, feed manufacturers, wild-catch fishermen, retailers and researchers. They came from more than 6 countries, including Norway, the UK and Canada. Roughly one-third of participants were attending their first Dialogue meeting. The full list of participants is in Annex II.

Key Points of Discussion

Reviewing Salmon Aquaculture Dialogue Purpose, Process and Work to Date

Day 1 of the Dialogue meeting focused on introductory presentations and discussions around the Salmon Aquaculture Dialogue's purpose, process and work to date. Presentations also included information about the Aquaculture Stewardship Council, the entity that will eventually house the standards and manage the third-party certification of farms against the standards.

Several key themes emerged from participants in the discussions on Day 1. They included:

- The difficulty the Dialogue faces in setting farm-level standards while taking into account cumulative effects
- A need for greater clarity around the scope of the standards – how far back do you go in the production process and sourcing of inputs?
- The need to address impacts in freshwater in a clearer manner
- The need for definitions of terms used in the draft documents
- The importance of feed as an crucial impact of salmon farming, and sustainability of wild fisheries as a critical point of concern for many participants
- Questions around the added value of standards developed under ISEAL guidelines, versus ISO-compliant standards
- Indicators can be viewed in two distinct categories: measuring impact, and measuring/assessing risk. Both are needed within the SAD standards.
- The difficulty of handling natural variation in the things that we are measuring (e.g. sulfide, dissolved oxygen), while maintaining a robust standard

Detailed comments on the draft indicators from Day 1 are included in Annex III.

Detailed Review of Draft Indicators

Day 2 of the Dialogue meeting focused on detailed feedback and suggestions around the draft indicators. Participants provided this feedback in small-group discussions around specific thematic areas. Notes from these groups are compiled into Annex IV. In the middle of Day 2, a small group of individuals representing the Green Warriors of Norway joined the meeting for about 10 minutes to argue that salmon farming cannot be done in an environmentally and socially responsible manner, and the Dialogue was therefore a mistake.

Next Steps

The Salmon Aquaculture Dialogue Steering Committee will use the feedback from this meeting, along with comments provided online, to create a refined set of draft indicators and draft standards. The Steering Committee will tap credible technical experts to assist them. The Dialogue has a Technical Working Group for feed issues, as well as a Social Technical Working Group to help create the technical basis for strong, relevant social standards. The SC expects to put out draft standards for public comment before the middle of 2010, and hold additional public meetings in 2010 to review the draft standards.

Annex I: Meeting Agenda

Salmon Aquaculture Dialogue Meeting
November 17-18, 2009
Radisson SAS Hotel Norge, Bergen, Norway

Meeting Goals

1) Update stakeholders on the Salmon Aquaculture Dialogue, ensuring participants understand the Dialogue process, work completed to date, timeline, and goals, as well as the important role of participants and means of participation.

2) Collect constructive feedback from meeting participants on draft indicators. Specifically, determine whether the suite of draft indicators sufficiently address participants' "big picture" of key potential impacts from salmon farming and request concrete suggestions for ideas (for indicators, data sources, or other) to be used to revise the draft indicators.

November 17, 2009

9:00 Welcome & agenda review

9:30 Background presentation on the Salmon Aquaculture Dialogue

This presentation and associated discussion will outline the Salmon Dialogue structure history, goals, work completed to date, and work that is currently underway.

10:15 Background presentation on the Aquaculture Stewardship Council

10:30 Coffee break

11:00 Presentation of draft indicators and the indicator development process

This presentation and associated discussion will take a big picture look at the principle, criteria, and draft indicators

12:30 Lunch

13:30 Small group discussion of draft indicators guided by key questions

15:30 Coffee break

16:00 Reports back from small groups and identification of common themes

17:30 Close of meeting

November 18

9:00 Welcome and review of Day One

9:30 Small group discussion of draft indicators by thematic area (1st session)

10:30 Coffee break

11:00 Small group discussion of draft indicators (2nd session)

12:30 Lunch

13:30 Gallery walk and plenary discussion

15:30 Moving forward

Presentation and broad discussion of next steps, including revision of indicators, standard development, and discussion on roles and opportunities for Dialogue participants and outreach.

16:00 Close of meeting

Annex II: Meeting Participants

First Name	Last Name	Affiliation
Niels	Alsted	BioMar AS
Karoline	Andaur	WWF-Norway
Petter	Arnesen	Marine Harvest ASA
Torbjørn	Åsgård	Nofima, Norway
Simon	Ashe	Salmon Watch Ireland
Clare	Backman	Marine Harvest Canada
Sebastian	Belle	Maine Aquaculture Association
Lise	Bergan	Cermaq
Trude	Bessesen	NSEC
Alan	Blair	Grieg Seafood
Katherine	Bostick	WWF-US
Steve	Bracken	Marine Harvest (Scotland) Ltd.
Alex	Brown	Mercotank
Fiona	Cameron	Sea Trout Group
Ian	Carr	EWOS Group
Sandhya	Chaudhury	Det Norske Veritas AS
Viv	Crampton	EWOS Group
Trine	Dale	Norwegian Institute of Water Research
Marius	Dalen	The Bellona Foundation
Steven	Damato	Changing Seas
Giovanni	Daneri	Centro de Investigacion en Ecosistemas de la Patagonia
Rebecca	Dean	Lighthouse Caledonia Ltd
Brian	Dornan	Scottish Government
Nigel	Edwards	Seachill (Icelandic Group)
Maren	Esmark	WWF Norway
Giuliana	Furci	Fundacion Terram
Janina	Gray	The Salmon and Trout Association
Joar	Grindheim	Intrafish
Jon	Grottum	FHL (Norwegian Seafood Federation)
Peter	Hagen	EWOS
Hendrik	Hahn	Gottfried Friedrichs KG
Randi	Haldorsen	Marine Harvest Norway
Frode	Haldorsen	Salmus Akva AS
Nell	Halse	Cooke Aquaculture
Pia Kupka	Hansen	Institute of Marine Research
Piers	Hart	WWF-Scotland
Aldin	Hilbrands	Royal Ahold
Brit	Hjeltnes	National Veterinary Institute
Katy	Hladki	The New England Aquarium

Tanja	Hoel	Norsk Sjømatsenter
Erik	Hognes	SINTEF Fisheries and Aquaculture AS
Jens Christian	Holm	Directorate of Fisheries
Rachel	Hopkins	Pew Charitable Trusts
Rudi	Jacobsen	Hallvard Lerøy AS
Rune	Jensen	Salmon Camera
Jodie	Johnston	Tesco
Eckhard	Kämmler	Gottfried Friedrichs KG
Line	Kjelstrup	NCE Aquaculture
Arild	Kollevag	Essentia
Per Gunnar	Kvenseth	Villa Organic
Scott	Landsburgh	Scottish Salmon Producers' Organisation
Guttorm	Lange	Norwegian Institute of Water Research
Tor	Larsen	NSEC
Trygve	Lea	Skretting
Gerry	Leape	Pew Environment Group
Blake	Lee-Harwood	Sustainable Fisheries Partnership
Anders	Lennartsson	IKEA Food Services AB
Kari-Anne	Lenrik	Essentia
Richard	Luney	Marks and Spencer
Alv Arne	Lyse	NJFF-Hordaland
Øyvind	Magnussen	Sekkingstad AS
Anne	Magnussøn	Norwegian Ministry of Fisheries and Coastal Affairs
Kjell	Maroni	Norwegian Seafood Federation
Christoph	Mathiesen	WWF-Denmark
Kristian	Matthiasson	Leines Seafood AS
Alison	McGarry	New Brunswick Dept of Agriculture & Aquaculture
Ian	Michie	The Seafood Company
Gredys	Molina	Universidad de Santiago de Chile
Paula	Moreno	WWF-Chile
Scott	Nichols	DuPont Aquaculture
Durita	Nielsen	Faroese Fish Farmers
Trude	Nordli	Norwegian Seafood Federation
María Paz	Oñate	Salmones Cupquelan S.A. (Chile)
Stina	Oseland	University of Bergen
Mia	Parker	Grieg Seafood BC Ltd.
Pamela	Parker	New Brunswick Salmon Growers Association
Corey	Peet	David Suzuki Foundation
David	Plumb	Consensus Building Institute
David	Rideout	ESQU
Jay	Ritchlin	David Suzuki Foundation

Jan Sverre	Røsstad	BioMar AS
Linda	Sams	Tassal Group Ltd.
Jonathan	Shepherd	International Fishmeal and Fish Oil Organisation
Ole	Skulstad	NJFF-Hordaland
Jamey	Smith	The Department of Fisheries and Oceans Canada
Don	Staniford	The Pure Salmon Campaign
Trond	Storebakken	Norwegian University of Life Sciences
Frode	Strønen	The Norwegian Coastal Fishermen Union
Britta	Suers	ICEWIND
Lars	Tomasgaard	Nordox AS
Anders	Tromborg	Nofima Marin
Harald	Tvedt	Det Norske Veritas AS, Research & Innovation
Aina	Valland	Norwegian Seafood Federation
Jose	Villalon	WWF-US
John	Volpe	University of Victoria
Mary Ellen	Walling	CAIA & BC Salmon Farmers Association
Lars	Windmar	Det Norske Veritas AS, Research & Innovation

Annex III: Compiled feedback from small group discussion on Day One

Compiled Notes: Day 1 of Salmon Aquaculture Dialogue meeting in Bergen in November 2009

Day one breakout groups focused on taking stock of the document and initial reactions. Ten small, diverse groups of 8 to 10 individuals were formed. Participants were asked to individually:

- Chose one of their highest priority issues (e.g. impact on wild salmonids, water quality, etc.)
- Spend 15 minutes reading the document to find draft indicators that address the issue
- Make two quick lists – what the document does well on that issue, and what needs improvement

The small groups then discussed the issues raised and each participant's analysis

The compiled notes below reflect the collective written comments from all of the small groups. They have been clustered together by issue area and were not edited. General comments not associated with an issue by their small group have been grouped into six themes and a final catch-all group for comments that didn't fit into another theme. Issues identified by the small groups have been compiled under issue areas.

Table of Contents of Comments from Day One

Comments related to scope/scale of certification:

- Need clarity and some decisions made on scope/scale
- Some indicators are company or area specific, and it is difficult to see how a company or site can manage these issues or address these indicators. What you measure and how you measure it is different for farm site versus area.
- The more issues we include or the larger the scope of the standard the fuzzier the goal becomes (in relation to energy use\climate change). How wide\far-reaching should we be?
- Need diagram to clarify the portion of the value chain this standard will certify to be clear for the audiences.
- Who does that and pays for it – having the industry do it creates potential conflict of interest
- Looking at the effects on wild fish is beyond what an individual farm can do
- Feed - % screened for disease
- Ecosystems are affected by so many things
- Audits are not always timed with the best times to measure and understand impact
- Regional differences
- Copper measurement outside the farm
- How to deal with non-marine feed source sustainability
- Is principle 1 (laws) within the appropriate scope, if so, it needs more definition
- Is there an opportunity for a regional / area based certification?
- Area based management is a good idea and may be the best way to deal with some of these issues where the farm seeking certification is not the only contributor to the problem.
- needs definition of "farm level" – scope of the assessment – covering freshwater and salt water production
- boundaries need to be considered – spatial and temporal
- General issue – where does certification begin and end.
- Question of whether this should we include energy that goes into making feed given this is such a large component of energy use on the farm? And, what about the other side of the equation – processing?
- Should we look at economic benefits of processing since it is important benefit of aquaculture?
- It should be practical and possible to measure the standards at site level.
- The standard being developed and implemented on a farm-by-farm basis does not address the overall problem (high level issues); alternately, each little improvement (ie each farm being certified to standard) does help and contribute to positive change.
- The document focuses on mitigation vs prevention. It would be good to focus more on prevention, especially with respect to health & nutrition.
- Not cradle to grave, does not cover all important aspects
- Transport – how far do we look? From the eggs? Feed?
- Food safety – a gap here

Comments related to components to include in the standards document and its layout:

- Need clear definition of what environmental sustainability means, if that is the goal of this process.
- We need a definitions section
- Some agreement that risk analysis should be part of the indicators to get at ecological impact not just on-farm performance especially for issues like disease and escapes, but some concern regarding

how you measure this. Some suggestion this would be helpful to get industry thinking about ecological risk and would work in accordance with precautionary principle.
- Siting criteria seem to be hidden within the document, but these criteria could be a good starting point for the indicators document rather than tucked in different places throughout the doc.
- Agreement that continuous improvement is critical
- Need better examples in the standards document – don't seem correct. Also, document very difficult to follow.
- Illogical flow from criteria to indicators – how does this relate to actual changes on the farm? Difficult to follow…
- Need to highlight good impacts\change tenor of it to be more positive.
- Document needs to be more proactive for the industry wants to become involved.
- Must be consistence on what the document wants to address – wild salmon / wild fish / wild population. Sometimes is confusion
- The principles must be more defined

Comments related to ISEAL and ISO

- Reliance on ISEAL a concern –it is unwise to restrict the process to ISEAL
- Positive is that it has established standard setting methodology and wider involvement, however there are no formal links between ISEAL and the International Accreditation Forum
- Markets want ISO accredited standard especially on the business to business level, either ISEAL or ISO 65 should be deemed acceptable
- Some felt that capture feed fishery should be ISEAL compliant
- ISEAL feed requirements / burdensome and excessive, how do we know this adds value

Comments related to addressing regional differences

- The standards have to be addressed at different levels to be representative:
    - Individual farms
    - Interactive effects of regions
- Standards could be related to % decrease/increase instead of flat levels.
- As long as the certification is linked to farms/sites it is not possible to include regional requirements in the standards.
- Regional differences have to be considered or else it will be difficult to implement the standards on farm level
- The natural variations are tremendous and it is difficult to establish standards across different coastlines (Chile, Canada, Norway).
- What standards make sense to have as one global standard? What is a sensible way to measure these?
- Site specific standard vs a regional multiple standard. How to define an area? The logistic / traceability issue. Is this doable for small farmers

Comments on the strength, feasibility and update of the standards

- Need for the standards to be aspirational
- Missing precautionary principle approach throughout
- Easy to make standards very rigid, but then we lose the continuous improvement element.

- Continuous improvement could also mean a simplifying and making the standard more efficient/cost effective
- It is important that the standards are narrowed down in order for being implementable for all fish farmers – independent upon size.
- Lack of focus on changing methods versus just standardizing current flawed practices
- Should talk about how standard will be maintained and revised to drive improvement

Comments related to freshwater and smolt production

- Freshwater consumption – is it included? Maybe should be at least reported at this stage, but maybe not require standard.
- Recirculation systems for freshwater smolt production with energy efficient and new technology should be encouraged.
- Freshwater separated from marine
- Not clear on smolt impacts-standards
- Smolt production in freshwater largely missing

Other comments:

- Seem to be missing closed containment components\emphasis
- Transparency
- Don't see benefit for sustainable industry
- Should be more implicit vs explicit – encouraged to achieve goal but not told which pathway to get there.
- Nervousness over other certification systems – how do we relate to those?
- Should we be looking at how much we should produce?
- It lacks retail engagement and does not broadly link, time consuming and not cost effective
- Sustainability of the industry overall is a concern –sustainability is tied to size and the process needs to address this issue. Otherwise the standards are irrelevant.
- Economic aspects not covered
- Regional expertise in legislation
- Standardizing current flawed practices rather than coming up with new standards
- Missing protections for sea trout (re sea lice)
- Government policies omissions
- Relocation is poorly covered – re changing siting to more sustainable areas
- Triploids in closed systems should be dealt with
- Europe framework is now dealing with estuaries – should look to this to see how to deal with P
- Who are we to set standards at a farm level, who are we do to this? Why us? What is our mandate?
- Are we really getting the right things to measure?
- In the whole document there is an assumption that all effects are linear (escapes, water quality).Is the effect of 100 fish escaping from one site of the same magnitude as if 1 fish escapes 100 sites?
- How to measure impact on wildlife? Above or below sea level? What indicators could be used?
- Variables we are trying to measure determined by units we are trying to protect
- synthetic colorants should be addressed – but recognize nutritional requirements need to be recognized as well as human health issues

- Shouldn't lose sight of the fact that we are talking about producing food, and very specifically a nutritious food.
- The standard must hold the farmer to a higher standard than just the regulatory minimum.
- It should also catalyze the use of new/better technology
- general issue with requirement for area wide monitoring programs – relates to each of 3.1.7, 3.1.8, and 5.4
- How to deal with issues that are not easy to measure
- Sentinel species need to be defined
- "Conserve" local habitat and biodiversity (protect might be better)
- Lack of participation of Norwegian wild environment issues
- Unit of measure linked to kg of production can be dfficult
- Are red-listings precautionary or based on lack of knowledge?
- How is the ASC going to view organic production?
- Focus on healthy fish both farmed and wild
- How does this as a standard fit with other standards, the marketplace, how will this be communicated?
- Sustainable aquaculture is just not the farmers responsible, also the authorities. The law could be good enough - but maybe not the enforcement. One farm could follow the SAD standard – but what if the surrounding farms do not?
- Awareness of the industry (environmental impacts) (big or small) – what are you doing? Would be country/company specific – but important. And how can you measure this? Will this be covered in prin. 6 and 7? Is the farmer's responsibility to contribute if certified?
- Indicator for support to research – inputs on what you do. Will show transparency. But how is this measurable? Some general statement – willingness to participate in relevant environmental research.
- What are the market saying – want they want from the standard
- Awareness of proximity. Are the sensitive areas

Issue: Government Responsibility

Working well

- Stand outside the process but just observe.
- As far as the comment that indicators are not proactive, this takes place in the standard setting not indicators

Needs improvement

- So many areas for problems in this doc re research needs, who needs what, etc.

Issue: Legal requirements & the law

- 1.1: How do you know which international regulations that are relevant for your site and your certificate?
- Have to be linked to the market you are operating in.

- Could international requirements be removed from this section – as this is a site specific certification.
- Dealing with the interplay between standards and law
- Exotic species are a significant issue
- Does national law accurately reflect either EU laws and national commitments to International treaties
- Does "compliance" apply to the farm seeking certification or to the owner of the farm in Norway e.g. a farm cannot deal with sea lice on its own, it must do so on an area basis
- What international laws are we including and how do we define the "compliance" with international treaties
- Indicators that are missing – the institutional aspect/administrative management. Not necessarily under Prin. 1 – law and enforcement are to different things.

Issue: Siting

- Good to have the mention of being a part of a neighborhood management plan
- Fallowing is important part of the plan – to avoid main risks. Needs to be incorporated.
- We dont want to measure the # of escapes or disease but the impact on the wild environment.
- Disease "jumping from wild to farmed fish" - clear that disease also endemic in the wild
- With regards to distance to migration routes (3.1.8), need to focus on fish health management, environmental management standards rather than focusing only on distance – will be challenging
- Need to identify migration routes – not every area has this information

Issue: Predator control

- Not proactive – nothing to say there needs to be a program for predator exclusion just says count
- Acoustic deterrent devices should be considered instead of shooting, and if the impact is low it should be considered as OK.
- Number of days is necessarily not the best standard.
- Number of seals have increased so greatly that it is difficult to manage. Siting is not necessarily the issue because of the number of seals moving into areas where they were not before. Concerns raised about this as it is not under the farmers control and concern about what standard may be applied
- Mammals – how to measure – not farm site, but in an area.

Issue: Escapes and impacts on wild salmonids (mostly related to Principle 3)

Working Well

- Good performance indicators to tell us what is going on on the farm
- In essence, issue and indicators captured
- Escapes indicators are well covered
- Criteria 3.4 .1 – 3.4.4 are useful for documenting what individual farms are doing to prevent escapes. Management practices that will provide indicator information to meet the goal of no escapes.
- Tagging as a possibility, can that be integrated into the standards?
- 3.4 is good but how will it be implemented. How do you set the standards and what is needed?

- 3.17d, 3.18c,
- Genetic marking should be the goal in the future. Concern that it is not an indicator that is functional for escapes

Needs improvement

- Impact of escapes on non-salmonids is not well addressed (i.e Chile)
- The impact of escapes in Norway will have different impacts than escapes in Canada.
- Escapes – just looking at what is happening but not what should impact
- But not much to tell us what it happening in the wild environment. We need some sort of risk indicator for escapes to help begin to address the ecological impacts. Use current invasiveness risk assessments and available science – this makes it precautionary versus just measuring farm production issues.
- 2.4 and 3FC difficult to determine distance –critical sensitive areas
- Add more specific language related to escapes regarding biodiversity
- Are voluntary agreements covered by government?
- Should measure the number of escapes in the area as a direct indicator
- Discussions related to escapes ends up in"hole in the net".
- Real reasons for escapes should be addressed, but we do not know for sure and are missing information.
- Big losses are public, but when you are only suspecting loss/ have small losses there is a different psychology.
- All losses must be recorded and reported according to local/regional laws
- It is important to look back and learn from your history
- How to control the number of fish in the cages? Counting practices have to be considered.
- What consequences will escapes have on your certification?
- What happens if there is a breach of compliance? What are the legal consequences of a breach?
- 3.4.1 need to clarify unexplained, must recognize errors in counting
- 3.5: not a good indicator from a farm level perspective. Is this still necessary given the other indicators listed.
- Some indicators are applicable to annual farm review and others are not.
- Good indicator for measuring effects on wild salmon. Concern about looking at the damage, Why have you not looked at the risk factor? Certification of farm construction.
- What can be traced back to each site? Some of these are not feasible to trace back to the site.
- 2.5: don't think that use of ADD is not necessarily bad and they can be used to prevent escapes
- 3.4 good but it's a little better than business as usual. There needs to be emphasis on improvement of the counting system that is beyond just the norm. Emphasis on rigorous counting procedures.

Issue: Ecosystem Impacts and Measurement

Working Well

- Understanding the inputs of the farming industry and measuring them
- Areas where we have surrogate relationships established are good (ie sulphide/redox)
- ID and recording of sensitive habitat
- Sea mammal impacts

Needs improvement

- Some mentioned above
- How do we deal with areas where the science does not have clear answers – if unclear, be precautionary
- E.g. cleaner fish have helped deal with lice, but do they spread disease, and what are we to make of the massive increase in cleaner fish catch
- Ecosystem complexity is difficult to measure or assess the implications
- Feed leakage is akin to "dumping" – standard of leakage should be zero – it takes out the fish in the pellets and the fish that eat the pellets and become unsalable.
- Environmental pollution – fish farmers in the same fjord-area. So how do you deal with this pollution and wild fish impact? If I am one farmer in this big area and surrounded by others, then how do I find indicators for one sea site?

Issue: Water Quality

Working Well

- AMBI is good in saltwater

Needs Improvement

- AMBI not good in freshwater
- Should measure P as well as O, CO2, N, pH and heavy metals
- Can use stress measures ISTAT (cortisol, blood sugar) to indicate water quality deterioration
- Marine water should use N
- Separate measurements in water quality recirculation
- Recirculation is energy efficient especially with new technologies
- Chile has limited freshwater resources
- Freshwater use should also be measured, hatcheries are particularly inefficient in use of freshwater
- Flow through freshwater systems have environmental impacts on freshwater systems which aren't addressed

Issue: Nutrient release, N and P, Principle 2

- Domestic wastewater plants in Denmark and Norway have seen dramatic reduction because of regulations – heavy investment by communities
- Need to require similar investment by salmon farms
- IMTA principles should be encouraged as a way of dealing with nutrient loading
- Nitrogen discharge is increasing in Norway – but not all environments can handle the increase
- Ie. Norway has identified 'problem' areas that need mitigation (study could be used as a reference) is being used in 2010 Plan for new sites under new regulation (check with Kjell Maroni)
- Land-based recirculation systems to minimize nutrient loading
- Integrated Multi-trophic approach to farming should be encouraged

- Should ASC identify best practice for current operations / achievable now but also give credit for innovation and new methods
- Nutrient loading is not a problem in all areas – nutrient poor areas like deep fjords
- Need to identify the issues with eco-systems that don't function properly – then consider potential reasons: over fishing / global warming / other users of the working waterfront
- Standards should identify need to manage waste on processing plants

Issue: Principle 2 (habitat & biodiversity)

Working Well

- 2.3.1 – fines generally OK
- 2.1.1/2/3 – ok generally
- 2.5.1 ok

Needs Improvement

- 2.3.1 – point of measurement where it enters cage is challenging; also need to be clear between fines in feed and fines in feed delivery after put through system – include lab assessment of quality with an assessment at delivery to cage
- 2.3.1 – how to define "fines" esp with FW feeds
- 2.1.1 – sulphide and redox do not necessarily correlate therefore can't be used as surrogates
- 2.1.2 – very expensive
- 2.1.3 – AZE needs to be clarified
- 2.2.1 – DO good to measure but very difficult to set a standard – very much out of farm control
- 2.4.1/2/3/4 – who defines critical, what distance and who defines – scope too broad – does not consider mitigation to protect critical or sensitive habitat or species
- 2.4.4 – difficult scope to verify
- 2.5.2 – sometimes preds have to be killed – should also refer to mesh size for pred nets – pred levels vary from year to year – killing predators can be done legally without being a sustainability issue – killing invasive species should be allowed
- 2.6.1 beyond the scope of the farm – many other factors influence
- Soft bottom and hard bottom needs to have clear indicators for both
- On soft bottom need to look at both redox and sulfide
- Baseline needed for faunal indicator in order to assess farm's impact
- Need to add total organic carbon and nitrogen in sediments
- Presence of bacterial cover under the farm should be considered and measured
- Concentration of copper according to baseline information on natural background
- Need water quality indicators for hatcheries / freshwater
- Can use percentage of saturation
- Need to specify where dissolved oxygen is being measured
- Add nitrogen concentration for marine environment
- Minimum depth of site and current speed criteria are needed for marine environment / siting decisions
- Digestibility of feed – link to feed / feces waste
- Cumulative affects
- Need to be clear about water quality and use of antifoulants

- Definitions of critical or sensitive habitat
- Add health not just morbidity of sentinal species
- Would divide mammals and birds (2.5)
- Marine mammals killed (or injured)
- Bio-diversity – need to calculate abundance of sentinal species
- Whether or not redo/sulphide us a good indicator depends entirely on site conditions – you would need to define the bottom type – this may not be a true indicator on some farms
- Minimum distance from critical species is a potentially meaningless metric – has not been demonstrated to be an effective tool – shouldn't be a "must pass" indicator. On the other hand, this does provide a means of protection (potential mitigation measure) for wild stocks in some jurisdictions
- Regarding 2.4.2 (distance from critical habiat)
    - Who/what defines critical habitat (there are regulatory definitions which are different in various salmon farming jurisdictions and "critical" means different things to different people)
    - If there is a designated protected area the standard should respect the defined area and not look to expand it/provide a buffer zone
- 2.1.2: Species biodiversity level data is very expensive and very hard to get. If farmers are required to gather this under the standard, no one will be able ot achieve it .
- 2.1.2: Even if there is a desire to put this responsibility off to another party (ie government) it would still be prohibitively expensive (and therefore likely not done in the end)
- 2.1.2: If we can identify indicators at the genus level rather than the species level as well as a proxy for bioversity health this would be good
- For 2.4.3 and 2.4.4: Note that these are different from those within 2.1
- 2.1.2: not a useful indicator for an operational farm over time because of the shift of species away from normal unimpacted sites. Not a useful way to monitor over the long term.
- 2.3 – impossible to measure

Issue: Interactions with wild salmonids and species

- Indicators are good for saltwater
- Good it is addressed
- Hardly covered for freshwater
- Should remember that disease jumps from wild to farmed more than from farmed to wild
- Very hard to measure in wild fish, who measures it?
- Each year is different, species move, motility of wild species
- The presence of pathogens does not necessarily mean the present of disease
- Define disease
- This is expensive. Stressful and can lead to even more risk to depleted wild populations
- Definition of sensitive areas
- We have very little information on the health situation of wild fish? No historical data.
- This should be the responsibility of governments to track and to highlight.
- Wild fish can also be sick!
- Difficult to be adequately rigorous and effectively applicable to regional issues. Distance from salmon runs is a key example.
- Is a risk based approach with regional variables

- Seems to be big denial of impact of salmon farms on wild salmonids. Draft indicators should maybe include acknowledgement of these impacts as a start
- Smolt raising in freshwater:
  - Smolt production and feed is altering wild migration patterns
  - Continuous low level leakage is the worst
  - Comment that SAD should adopt a no lake smolt production standard
- Measurement of wild impacts:
  - Who does that and pays for it – having the industry do it creates potential conflict of interest
  - How do you deal with individual farms contributing to an area-based impact linked to the total number of farms/farmed fish (vaccines or closed containment seem the only answers; mechanical, functional feeds, cleaner fish also listed)
  - Sea trout are not mentioned and are bearing the brunt of some of the sea lice issues in the UK
- 2.4.2, 2.4.3. 2.4.4 are not useful at the farm level.
- 2.4 - Cumulative impacts is good but needs some work re impacts
- Related to Criteria 3.4
  - Need to measure escapes into biology outside of the farm ie. Sea lice assessment on wild fish, need to do the same on farmed fish. Could limit number of farmed fish in relation to spawning population of wild salmon. Need an indicator to measure impact of farmed escapees on wild salmon in the river. 15% of fish in the spawning rivers are farmed (Norway)
  - Need to recognize different jurisdictions, different numbers of wild salmon, different numbers of escapes, areas where there are no local stocks.
  - Technical requirements for farms – should have specifications that meet specific environmental conditions (wind, currents, storms etc.)
  - Limits for escapes must be realistic for cage culture – also consider energy consumption of the alternative (land-based)
  - Escapes should not be higher than wild salmon stocks
  - Focus should be on prevention, not mitigation
  - Could use the Basel Convention re: introduction of non-native species
  - Should have a risk assessment process to identify possibility of new species to spawn in the wild

Issue: Migration routes

- 3.1.8 If the area is open for aquaculture this should not be an issue, if it is not open it will be not be relevant anyhow?
- This is depending upon local/ national regulations
- 2.4.1 is a different way to express the issues of 3.1.8
- Will it be measured how sensitive these migration routes are? Will always be sensitive if the disturbance is big enough

Issue: Non-native stocks or species

- Should use the risk assessment dot point (strong agreement).
- There is nothing that addresses maintain the genetic integrity of wild populations in situations where native species are farmed. Some attention needs to be given to this.
- It is unacceptable to allow non native species to be farmed in areas just because they are already farmed there. This needs to be coupled to risk assessments and any introduction should be based on internationally established protocols.

- Hard to say what impact non-natives have (may be difficult to confident that non-natives will have an impact)
- Aquaculture related ballast water - ballast water can introduce non-native species. Just not the big ships, also local boats / feed suppliers. If used in salmon farming then it can contribute to be a treat to biodiversity by introducing non-native species. Well boats here also. And water-use is not mentioned – what would be the standard. Should be addressed

Issue: Energy & Waste/Trash

Working Well

- Like the focus on energy\greenhouse gas emissions
- Including feed impact re energy use would be good incentive for feed producers to produce more efficiently.
- It should be possible to look at fish in terms of comparison with other livestock eg pigs, beef, and chickens. Fish may have lower carbon footprint and should be included in food security plans globally
- Very important that the end product has good assurance of environmental efficiency for the consumer

Needs improvement

- Should look more into feed production – should look at climate impact since much of the climate impact comes from feed production.
- Look at Carbon Disclosure Project – industry reports direct and indirect energy use\climate impact. Maybe the farmers should report climate impact from feed production. Look to feed producer to report energy impact from each batch.
- Maybe first criteria is just reporting of this number to start benchmarking data to create standards from this new data.
- Should think more about carbon measurement
- Perhaps should include product LCA
- Water use as an indicator
- Processors need assurance of: Health of the food, lack of chemicals, animal welfare, and low environmental impact.
- In the longer term a proportion of renewable energy use should be an indicator as it becomes more available
- Should think more about carbon measurement
- Perhaps should include product LCA
- Water use as an indicator
- Processors need assurance of: Health of the food, lack of chemicals, animal welfare, and low environmental impact.
- In the longer term a proportion of renewable energy use should be an indicator as it becomes more available
- This section could be removed as 95% is coming from feed.
- It will be more relevant when speaking about closed containment systems.
- SIK in Sweden has published a life cycle study on salmon production.

- 4.4 should have a "reduction of waste per unit of production" indicator
- GRI has a good indicator for recycling
- 4.5.2 – should talk about share of energy from renewable sources
- 4.5 GRI EN3 and EN4 – this would be a baseline for eventual LCA
- Need an indicator on direct GHG gas emission (kg GHG/tonne of production)
- We need to include the feed energy inputs on the assessment of energy efficiency – got one comment that an organic producer is asking for this.
- This is still not a cradle to grave standard; eg shipping by plane sends it off the charts
- Does the standard exclude feed energy consumption – how? Should be included in 4.5 or 4.2? It's the farmers responsibility to choose which feed producer they buy from
- The full ecological footprint of feed transport. Best practice here. Does it matter if you could compare with other protein producers? Indicators on energy on transportation of eggs? Lack of benchmarking

Issue: Feed

Working Well

- Good that it covers the sustainable use of resources
- ISEAL requirement is good – helps for the credibility for the source of feed
- 4.2.1 and b – generally Ok
- 4.3.1 – ok – needs to clearer with recognized moratoriums
- 4.2.1 – exc if IFFO standard included as ISEAL comp
- 4.3.1 – agree
- It is good that 4.1.1 is calculated separately for meal and oil
- 4.2 is good in that it ensures effective use of one of the industry's "input' resources
- Vegetable: 4.3 this is good.
- 4.1: good that there is a split between meal and oil. There may be a need to go further. Shouldn't set up an indicator that encourages industry to source specific species that will allow them to be compliant. Check with Lise.
- Principle 4 in theory is good because it has big impact
- Principle 4: Responsible source and efficient use are both important

Needs Improvement

- The total amount of feed ingredients is limited and this is an emerging sustainability issue
- Use of limited resources overall is a concern
- Concern about limitation on use of marine ingredients
- 4.1, 4.2 and 4.3 need more work
- Plant materials in feed needs to be addressed –non marine ingredients
- GMO free ingredients should be revisited –others felt that this is possibly addressed in other standards
- Health of the fish must be considered when choosing feed ingredients
- 4.2.1 -national lists in each country should be added to indicators until all fisheries are certified
- Fish Source is good independent methodology and should be used-tilapia and pangasius are already using this

- Freshwater resources are also an issue
- Non-equal treatment of different feed sources marine non-marine and land animal protein.
- ISO certified feed sources (eg IFFO) should be exempt form FFER in general or at least specified as required in the interim standard. But, no certified sustainable fisheries as yet.
- Use fish meal produced from salmon as compensation in FFER
- It should be remembered that if fish meal is not used it has to be substituted with something else which also has impacts.
- If fish meal isn't used for fish feed it will not stop being produced so where will it go? Probably to somewhere it is used less efficiently.
- In places that have their own close source of fish meal imported meal means this could mean increased transport cost/carbon.
- GM feeds either good (omega 3) or no GM at all.
- GMO-feed/land animal protein must be addressed/mentioned – is not tackled in Prin. 4. Why? Different views in Europe and in the US. What is the position? The feed containment should be addressed
- Use nitrogen or another nutrient efficiency as a measure of resource utilization e.g. N used and N out.
- Unsure how you go about defining sustainability with respect to the various feed sources and using carbon footprint (different ingredients have different environmental footprints)
- We do not address product quality and seeking to decrease the overall usage of marine fish ingredient within the diet – reduction of marine fish ingredients in the diet affects the nutritional quality of the end product.
- Need to have something that measures the importance of the ingredients in fish feed for fish welfare and fish health.
- Food will have some impact on the fish health. This is not reflected in the document. Perhaps its not possible and you do not know the limits. If you feed on pure soy its not healthy for salmon. This is indirectly picked up on the diseases.
- No PCB and heavy metals. This is an environmental issue. Marine component needs to be tested and there should be limits set for compliance.
- Need to specify that byproducts are not allowed form the same species
- Energy audits need to account for that used in feed.
- Feed and Principle #1
    - Legal requirements for raw materials used for feed
    - Some countries are further ahead in fishery management than others, esp EU illegal fishing regulations do not apply to fishmeal and oil but to all seafood consumed / imported into the EU but not for feed
    - Need to stress use of feeds from non-regulated fisheries (not same as illegal)
    - Dialogue should require certification for fishmeal and oil that is obtained for human consumption
    - IFFO certification will include compliance with fishing controls – still unclear about certification standard
    - Dialogue should explore if those certificates could be maintained and used for standard
    - Based on IUU risk assessment as a minimum
    - Should specify regulations on labour, environment, fish health, food safety, indigenous people
- 4.2 & 4.3 Source (don't understand the use of ISEAL instead of ISO) why ISEAL not ISO – some analysis of why ISEAL instead of ISO.
- Criteria 4.2
    - Needs tightening up so definition of sustainability score is better defined – esp in interim

- MSC – might cover this in next few years but we need a robust alternative scheme
- Use of fish source as a scoring system is missing
- Specify source of fish is not sufficient – only defines fishery as sustainable, but does not deal with traceability
- There might be value in terms of having a by-product indicator that is separate

- Criteria 4.3
  - Need to address farmed fish species as a source of feed – regardless of practice and jurisdiction this should be spelled out
  - Dialogue could encourage less use of marine protein but reduce quality of fish and fish products / need to maintain nutritional health benefits
  - Should not accept farms to certification unless they have achieved certification to one of the partners' programs on food safety
  - this needs to be strengthened to be certified ingredients from ISEAL compliant processes within X years.
- 4.1.1 FFER problems
  - Seasonal and annual variations in levels
  - Within regional variations
  - Encourages catch of high fat fish to skew ratio which may threaten/pressure high value wild fish
  - Must clearly differentiate salmon specific needs
  - Should be replaced with a nutrient-based ratio – ref EWOS proposed marine protein/oil dependency ratio
  - FFER is not precise enough. The standard should go for nutrient levels instead – protein and EPA + DHA levels would be a better indicator of efficiency of processing and utilizing the marine fish resource – FFER does not capture how efficiently the marine lipid (from feed) is incorporated into the end product (salmon)
- Organic feed ingredients could be one "pass" indicator for feed ingredients
- FFER is not relevant – need nutrient ratios not weight based ratios
- Marine protein dependency ratio and a marine oil ratio
- No accounting for difference in the oil levels of different fish
- Measurable indicators for leaked food needs to be covered
- Closed containment really seems like a smart way to address many of these things

Issue: Criteria 4.6 (copper, non-therapeutic chemicals)

- 4.6.1 ok
- Recognition that fouling needs to be controlled to maintain optimal farm management – partially covered in princ 3 section B
- Should cover other biocides not just copper
- 4.6.2 Method for copper and zinc in sediment needs to consider organic and sulphide content
- 4.6.4 Background level difficult to assign either in sediment or biota
- 4.6.3 – some biota may not retain in tissues therefore levels may not be indicative of exposure
- PcB/dioxin in the sediments, not just copper.. Also touch upon the subject of cleaning the fish oil – would minimize PCB/dioxin in the feed

Issue: Chemical Use & Contamination Levels

- If you follow this format, then 4.6.1 should be zero. If you are not treating none of the below indicators matter except for measurement of zinc
- Copper and Zinc should be split out as it makes it more complicated.
- Could promote the phasing out of copper nets but banning the reapplication of copper on the nets.
- Are their other metals that should be included.
- Are their alternatives that should be included.
- The goal should be that there is no copper nets.
- Other perspective is that if copper nets are used then
- Should you ban the washing of nets at site?
- 5.3.1: what kind of proof is going to be required. Why don't they spell out that this means veterinary records. This may not be the case in all countries.
- Why doesn't 5.3.1 say that all use of chemicals should be documented.
- Found the language somewhat confusing
- Line of reasoning needs to be document for chemicals used, their concentrations, and the procedures for application, and legal compliance.
- You need the documentation to determine how you carried out the procedure.
- There is no need for 5.3.3 because 5.3.1 covers it. Others disagreed with this.
- Should there be how many times or how much are you able to treat? This may be covered by 5.3.4.
- How many happen is one measure, how many are done by a vet are another?
- How many times is Slice allowed, how many bath treatments. Etc?
- 5.3.1: after concentration add "of active ingredients"
- 5.3.4: change "veterinarian" to "approved/authorized fish health service"
- Something to measure the impact of the chemical rather than just the use, e.g. do an antibiogram
- There is a difference between banned and non-approved chemicals
- Only use products that have had research done on non-target species rather than measure the content in the benthic taxa as they move around
- 5.2.1 could be moved to 5.3 and 5.2.2 could be removed.
- It is a requirements for farms (in some regions) to record/report why your fish is dying – could be important in order to take action fast.
- 5.3.2 The primary producing countries are all the countries producing salmon today.
- Non-therapeutic chemical use should be in Principle 2 somewhere instead of Principle 4.

Issue: Disease/Lice

Working Well

- 3.1.7: this is very important
- This is going to require an unprecedented collaboration between NGO's and the industry and scientists in order to make this workable.
- Area Management plans requirements is good but you need to ensure that these plans are actually working.
- 3.1.7: Critical important to have a maximum lice cap within a whole bay. Per fish basis is not sufficient. Total number of lice is what is important
- Movement of fish after harvest is a huge risk factor for contracting diseases. How is this addressed in the document?

- 5.1 is good and the strongest of all of the dialogues.
- Fallowing: you need to fallow. Fallowing should cover all species and not only Atlantic salmon. % of cages may not be a good indicator 5.5.1. If you are talking about % you need to have an area that is clean. Needs to be 100% if you want to make this effective.
- Agreement that it needs to be more than sea lice per fish. What happens if a new site comes in and affects your compliance
- 3.1.7a: Single class stocking is a good method for controlling lice. It should be hugely controlled and encouraged.
- Some indicators may be not very applicable to measure what we want to. 3.1.7b: won't be useful until a knowledge of wild diseases is better understood.
- 5.4.1 and 2: good ideas. 5.4.3: research project that has limited use. Question about its usefulness.
- 5.1 is good and the strongest of the other dialogues
- Time needs to be spent thinking about how these will actually happen in reality. What is likely to be required is an unprecedented level of collaboration.
- 5.5.3: are we talking about dry commercial feed? This needs to be defined?
- 5.5.4: risk index needs to be clarified.
- Good job of turning BMP;s into metrics.

Needs improvement

- Measuring diseases in the wild fish – but how should one sea farmer do this? If a producer has this standard, we want all of the sites to comply eventually.
- Most disease comes from wild populations so need lot more science before asking farms to monitor wild salmon. Not clear who will be responsible. Not much information on wild fish today.
- 3.1.7 c needs to be explicit about smolt measurement of lice levels and the known mortality factor
- Affected area is much bigger than is currently understood –the indicators need to focus on the wild fish
- Spreading of disease to wild species and between sites is linked to area management
- Disease and maximum density: 3.1.8 the max density is linked more to the siting of the farm than to the actual density of each farm. In some areas like Chile – this is an important issue.
- Related to fish transport:
  - What kind of tests are required? Should be more important than the % tested.
  - The type of disease tested for will vary.
  - 3.1.2. How can you prove that a disease have not jumped into the wild? Is this a responsibility that is linked to the farmer or is it a public task?
- 5.3.2 – if banned products are illegal (against P 1) why would you need to declare % (should be 0)
- Note that "banned" is a specifically defined term (previously approved but no longer) and points to human health concern – therefore we should be cautious in use of this term (is that what we really mean here)
- Need to improve the wording around 5.3.2 – various interpretations could be had.
- 5.3.3 – problem with reference to "active ingredient" rather than specific drugs. Perhaps this concern re amount of ingredient being introduced into the system is actually addressed under 5.3.1 reporting on proper dosage.
- prevention over treaetment and
- transparency

- 3.1: will you require baseline studies to determine natural disease levels? The work associated with these standards could be significantly challenging given the uncertainties. Basline data needs to be done before you can come up with meaningful.
- Concerns about the do ability of the disease standards on a per farm basis.
- Will this require data from each site and that is a concern
- 5.1 and 5.2: good indicators. 5.3 is good except 5.3.2: concern about the clarity of this indicator. Does this deal with Food Safety. Seems inappropriate to have this indicator here given that it might be against Principle 1.
- 3F: 3.1.8: a and b should be separated from c at a minimum. A and B are annually assessable on audits, C is fixed by location of the site. One stakeholder said that C must be included in the standards and cannot be left out due to the risk of operation regardless of management success. Another stakeholder said that c is not a good indicator if it fits within the legal framework of siting because its unchanging year over year. Some of these are measuring damage and some are measuring risk.
- 3.1.7c: not effective as an indicator on a per farm by year basis unless wild salmonids are both present and monitored. Could require periodic review of wild fish in order to compare with the

Issue: Biosecurity

- 5.5.3 It should not be necessary to screen the feed ingredients themselves for diseases
- 5.5.5 It is important to have as few smolt producers as possible
- 3.4 There are no regional measures related to the genetic variance between Salmon populations and the impact of escapes
- All cages should be single year class (remove %)
- Need to clarify sea lice counting protocols / methodology

Issue: Principle 3 and 5

Working well

- Seven point plan a-g provides good coverage and roadmap, and good example of how complete package could be presented

Needs improvement

- *Need to look at how to monitor fish health in wild populations – not just salmon also sea trout*
- 5.3.2 should not allow prophylactic use of theraputants, should draw attention to misuse or abuse
- 5.3.2 could be used as a trade barrier – definition of banned needs clarity
- Egg/brood stock should be covered in prin. 5

Issue Criteria 3.1 (introduced/amplified parasites & pathogens)

Working Well

- 3.1.1 very good
- 3.1.4 good
- 3.1.7 area management approach is good and necessary

- 3.1.7 b – OK

Needs improvement

- Need to clarify fallowing and age class separation
- Farm can only work on farm things
- Testing requirements should relate to local jurisdiction requirements – better reflect local risks
- What is transport? Time window? Concept of "lots"
- Record keeping requirements?
- 3.1.2 could be out of farm control
- 3.1.5 required in some areas but not as a general
- 3.1.5 % not a good measure – the actual number of fish tested is important – more clarity
- 3.1.5 clarification on what would actually be tested
- 3.1.6 connected to above
- 3.1.7 specific details will be location specific
- 3.1.7 c – not practical or possible – should focus at farm level
- 3.1.7 d – same as above with part c – challenge will be that wild fish health monitoring and management is a government responsibility and farm has no influence on this
- Regarding 3.1.7:
  - The standard is to be developed for the farm, therefore what is the responsibility of the specific farm vs the responsibility of another authority
  - farm-based vs area based creates a conflict within the standard (this is an issue in 3.1.7 as well as 5.4)
  - the standard should not make the farmer responsible for things outside the farm / outside of his control – otherwise this would be a disincentive to participation
- 3.1.8 a and b – density not a good indicator by itself
- 3.1.8 - difficult to set distances, need to protect areas but how to set buffer zones, also out of farm control

Issue: Criteria 3.3 (transgenic species)

Working Well

- 3.3.1 generally OK

Needs improvement

3.3.1 – should not triploid or sex reversed fish

Issue: social impacts

- Does the public approve of the farm and the need to balance different viewpoints
- Fishermen should be a stakeholder included in the Social category

Annex IV: Compiled feedback from small group discussion on Day Two

Compiled Notes from Day Two Break-out Sessions
Salmon Aquaculture Dialogue, Bergen, November 17-18

On the second day of the Dialogue meeting, participants elected to participate in one or two small group discussion sessions. Each breakout group focused on a different principle. Each group was asked to provide concrete suggestions for revisions to draft indicators, keeping in mind the framework that indicators should be both a proxy for measuring environmental and/or social impact and feasible / implementable. The compiled notes from those breakout groups are below.

Principle 1: Comply with all applicable international and national laws and local regulations

- Documentation of compliance (as per bivalve) with appropriate environmental and social legislation
- List of key cornerstone legislation and regulation in each jurisdiction
- What are international laws?
- Are there gaps in enforcement and legislation?
- Material and non material needs to be considered
- Governments role in verifying compliance
- Timelines –permits licenses and how they line up with the certification time period
- Two levels –start up and operational
- Where does reporting fit?
- Reference this in every indicator

Principle 2: Conserve natural habitat, local biodiversity and ecosystem function

General comments:

- add indicators around presence and compliance of an environmental management system
- specify "inside farm" as company's job. "outside farm" as regulator's job

Criteria 2.1: Benthic biodiversity and benthic effects

- 2.1.1: Delete the "or" for Redox and Sulfide: (use both)
- 2.1.2: Re: AMBI – be sure to specify where and when it is measured – consider other fauna/indicators
- New indicator: Direct Measurement of oxygen use ABC curve
- Possible indicator based on concentration of theraputants in feed in addition to or instead of measurement in benthos
- Some discussion of making certain tests "tier2 " (i.e. only required if another trigger is reached)
- Missing: indicators for hard bottoms/erosional
- 2.1.3 Is total use of therapeutants a better measure than sediment level i.e. covered in principle 5
- *recommended "opt out" clause for farms with no therapeutant use

- AZE not used everywhere define area
- Suggested new indicators: TOC TN C/N ratios depth, current
- Need to specify fresh and salt water indicators
- Research need: relationship and effect of various theraputants to various benthic characteristics/bottom types

Criteria 2.2: Water quality in and near site of operation

- freshwater measurements need to be relative to incoming water
- what about just saying "no fresh water smolts from Cages"
- metals in sediment belongs here (p2)
- Make sure indicators are rationalized to both natural cycles and production cycles.

Criteria 2.3 Nutrient release from production

- Add nutrient release levels to this
- discussion of whether the "farm based" approach can work (companies and regions are critical to understanding overall environmental performance.)
- Explore linking nutrient relase (2.3) with FCR (relate to Prin.4)

Criteria 2.4 Interaction with critical or sensitive habitat and species

- 2.4.3 Add indicator on plankton and crustaceans
- New indicator around presence and compliance with an IPM plan
- 2.4 change "wild salmon" to "wild salmonids"
- recommend looking at regulatory requirements for critical habitat/species protection in various jurisdictions
- distance from habitats/species is not scientifically linked to impact. Focus on documenting local areas/species and managing impact

Criteria 2.5 Interaction with wildlife including predators

- 2.5 Indicators not rigorous enough and should be more pro-active focus on avoiding attracting predators
- Make separate indicators for birds and mammals
- make separate indicators for culling and entanglement

Criteria 2.6 Cumulative impacts on biodiversity

- 2.6.1 Add abundance
- Sentinel species are very difficult to use. The link between them and farm impact is not well established.
- measure concentration of therapeutants in feed

Principle 3: Protect the health and genetic integrity of wild populations

General comments:

- Some indicators on farm level measurement, some R&D-based/more needed, some authority based
- Potential overall indicator of data transparency
- Indicator of scientific cooperation
- Split document into:
  - What regulations should require
  - Req'd area/region
  - Farm level requirements
-

Criteria 3.1 Introduced or amplified parasites and pathogens

- Suggested new indicator: # of sealice on migrating smolts might be a good indicator (< 10/smolt), but not agreement as some think difficult to monitor reliably
- Is it possible to have an area based ecosystem indicator?
- Has been monitored in Canada without finding correlations, but find in UK and Norway (should check scientific articles). Not measurable on site level.
- Difficult to find farm based indicators
- Contribution to local/regional sealice monitoring/research programmes could be an indicator
- UK find high numbers of sealice on wild fish in times when farms has low levels
- Should we be measuring:
  - Sealice on farmed fish
  - Sealice on migrating smolts (if so we need regional/area stds not global)
- Approach for indicator could include
  - reqt for area cooperation
  - farm level performance ind
  - regulation reqt
- Struggle b/t measuring farm performance (can do) vs ecological impact (much more difficult but may make std more consistent/accurate
- Need both 3.1.4. and 3.1.7. or can combine these?
- In absence of ability to measure wild impact now do we:
  - require info gathering
  - rely on peer-reviewed sciense, as available
  - just set farm mngmnt stds
- 3.1.2: take out … requirement to show through environmental testing that disease hasn't jumped into the wild… (difficult to measure, pathogens already there even if not previously detected) (local programme to look for diasease agents might be possible)
- 3.1.4: Suggestion to include …"related to agreed maximum area lice levels"
- 3.1.5: Need better definition, transport to further production, open/closed transport to slaughter etc.
- 3.1.7:
  - Difficult to define migration routes
  - Need to look into smolt input sites etc
  - 3.1.7. a ok, may belong in #5 instead (fallow etc)
- 3.1.7. c:
  - disagreement if can be done or not
  - onus on farm to measure wild impact vs part of large mngmnt scheme
  - Need to standardize count of lice on wild fish (ISO-process?)

- 3.1.7d:
  - Potential indicator occurrence of disease agents on the farm found in the wild
  - Should focus on diseases actually occurring on the farm
  - Should have a trigger level for which disease agents to look for the relevant disease agents in relevant wild fish, could build an indicator around this
  - Suggestion for an indicator on contribution to relevant research
  - This is very difficult to achieve, difficult to sample dead fish
  - You need to kill wild fish to do this, but could be done on caught fish
  - All species??
  - Important, but difficult on site level
  - Problem to measure disease other than lice in wild fish, and how about # of species?
  - Is "wild fish" too big scope for this std? How to define/simplify?
  - Can we turn this around, measure diseases on farmed fish that are found in the wild?
  - Use trigger levels on farm to dictate reqt to measure diseases on wild fish

- 3.1.8:
  - C) Has to define how distance from… should be in the indicator, how to take care of long fjords and distance from river mouths.
  - Will it reduce the infection pressure if you move a farm away from sensitive areas if management is following all other rules
  - Questioning if a), b) + c) is covered in previous indicators
  - Is density (kg/m3) relevant for disease risk from farm to wild.
  - Might look into an indicator to have done an EIA?
  - # of hosts + size should be included into some of these indicators (disagreement on this)
  - Add # of fish (instead of kg's)

Criteria 3.2 Introduction of non-native species

- 3.2.1 Should reflect use of other species in the farming of salmon, such as cleanerfish

Criteria 3.3 Introduction of transgenic species

Criteria 3.4 Escapes

Critera 3.5 Interaction with wild salmonid populations/runs

Principle 4: Use resources in an environmentally efficient and responsible manner

General comments:

Life cycle analysis allows better systematic approach allowing operators to optimize all inputs to achieve an overarching goal. But, better to continue the present approach in the interest of time. Feed highlighted as major factor in latest LCA analysis

Criteria 4.1 and current indicator 4.1.1 (FFER):

- Indicator on FFER – explain briefly why this indicator must be in the standard and what environmental issue it addresses.
- But why do we want FFER to go down? It is arguable that farming should take more of the worlds forage fish meal as it is used more efficiently by fish. Sustainability of fisheries is the important issue why do we need FFER.

- FFER is a very imprecise measurement, but accepted for other species, but another indicator should be included to indicate precise transfer of resources from environment to farmed product eg EPA, DPA, DHA (included as aggregate.) and protein.
- Suggested adding a new indicator addressing dietary energy efficiency. Kcal in/Kcal out (energy flux?).
- Add nutrient based ratio's in addition to FFER. Can be protein, energy or "fishoil" (specific formulas exist and can be provided)
- Nutrient ratios, nutrient transfer and nutrient balance should be used as an indicator.
- Both FFER and nutrient balance should be included (this has general acceptance). Nutrient balance is an exact measurement compared to FFER which is a very imprecise calculation. Protein and essential fatty acids should both be used. Some question about how this would be audited on farm.

- Calculating FFER:
    - Trimmings from any type of legal fisheries and aquaculture (but not same species) should be excluded from calculation. Clarified by using the word Forage Fish in the formula. Includes only fish caught directly for feed purposes. Original calculations did not mention that trimmings are 22% of world fish meal.
    - Suggested proposal that certified fisheries should be excluded from the calcuation. Noted also that the certification of forage fisheries is not without controversy either.
    - Fish meal from trimmings are assumed to be equivalent to fish meal from forage fisheries in terms of trophic value.
    - Definition of 'Forage' is important as it could change the way the formula is calculated.
    - Exclusion of trimmings from legal fisheries and aquaculture from FFER
    - Better definition of forage to exclude fish suitable for human consumption.
    - If Jackson's (IFFO)formula is published this should be considered.
    - FFER refers to Tacon/Metian.

- Environmental groups would consider the non-inclusion of FFER as a deal-breaker.
- Exclusion of FFER as an indicator as long as fish meal and oil are from sustainable sources.
- There should be a statement somewhere (perhaps in the preamble) recognizing that reduction in some marine nutrients can have detrimental effects on fish health and reduce the human health benefits of the product. Therefore the drive to reduce FFER should reflect this and could be indicated in the levels of the standards eg minimum EFA levels for human health. The goal being to find a balance between minimizing FFER while maximizing human and fish health benefits.

Criteria 4.2: Source of marine raw materials

- Criteria 4.2 should be moved to be 4.1. This to stress importance of sustainable raw materials as a first issue / priority

Indicator 4.2.1a: % certified

- ISEAL accredited is wrong assumption as it is only about process not about content. Need to refer to FAO guidelines. Who is benchmarking, there is no globally transparent benchmark. Either ISO65 or ISEAL accreditation should be acceptable. Retailers need some sort of accreditation right now. Should not be limited to ISEAL.
- Instead of referring to ISEAL compliant, refer to that the certification scheme must be built on the same basic principles as ISEAL. (ISEAL becomes refered in the standard)
- Need a meaningful analysis of ISEAL v ISO65. Must comply with FAO guidelines. ISEAL sets the guidelines for standard setting. Eg Process should engage a very broad multi-stakeholder process.
- Since there is no ISEAL compliant standard available (or other equivalent ISO65), need to define a sustainable benchmark and refer to future aspirations with some kind of action. MSC should be captured in some form and in fact there is an MSC certified fishery in the form of Spring Spawning Herring.
- The absence of existing measurable indicator leaves inability to act now so interim measure needs to be implemented.
- Rather than using a definitive time a relative time should be used such as: XX years after appearance of certified product should be the standard measure.

Indicator 4.2.1b: Initial steps

- Make use of systems that are already available.
- Use FishSource methodology. FishSource is a tool that can be used as part of the process. But not an open process so a little vulnerable to change, but this is due to real-time changes in the fishery. Not ISEAL compliant or an ecolabel, but it is a robust method for generating scores and is already used in other AD standards. Measures should be calculated at the time of capture.
- Use IFFO RSC as an interim measure as product becomes available?
- Also IUCN redlist and FAO overfished category should be used to exclude fisheries.
- Encourage use of IFFO scheme on responsible sourcing

Criteria 4.3 Source of non-marine raw materials in feed

4.3.1 non-marine products

- Should include at least one more indicator.
- Animal by-products and GM products are both issues that could be addressed. These issues are geographically different due to different cultural/political /legal issues and are therefore market-based decisions.
- Encourage use of land animal proteins

- GMO issue. Important issue. Be clear on direction.
- There is agreement that animal by-products are useful in reducing environmental impact of feed. However, it was felt that it was unnecessary to include any indicators around it as it was a divisive subject and could weaken the acceptability of the standards among retailers and consumer groups and NGO's.

- Must include sustainability of vegetable products in the same way as for marine sources. However, apart from soy there is no real equivalent to MSC or FAO for maize, lupin, wheat, legumes, etc. Soy and palm oil roundtables are now in existence and should be mentioned or used as indicators.
- Traceability of ingredients is a key indicator.
- Split indicator on "non marine raw materials" in two
  - Non marine raw materials
  - Tracebility of raw materials

- New indicator (4.1b) relating to PCB's and Dioxin (organochlorines). Measurably reduce concentrations of organochlorines and heavy metals in the oil-based fraction of feeds. Can be measured in the raw material or in the end product. Environmental issue because organochlorine and HM's are removed from the environment through extraction out of fish oil. This would be a positive contribution from the industry to the environment. Accepted standards already exist (TEQ's). Demonstrate decreasing levels over time means product gets cleaner and pollutants removed from environment.

Criteria 4.4 Non biological waste from production

Criteria 4.5 Energy Consumption and Greenhouse Gas Emissions

- Indicator on energy used in raw materials and feed (exactly what to measure and report must be elaborated)

Criteria 4.6 Non-Therapeutic Chemical Inputs

- Extend copper to be all types of antifoulant agents (at least if negative environmental impact)
- Add a indicator on cleaniness of nets

Principle 5: Manage disease and parasites in an environmentally responsible manner

General comments:
- There was much talk about the need of a Fish Health management plan.
- Also, fallowing and other biosecurity measures are totally absent and are needed.
- Access to treatment data was controversial.

- Technology must be changed because it is impossible to prevent negative impacts. Closed containment is perhaps one alternative
- Closed containment will need a large boundary around it
- All fish should be individually tagged
- Aggregated feed waste should be recorded (attracts wild fish). Farmers need to document that feeding is stopped when fish are satiated
- Where does reporting to the certification body fit?
- Prerequisite to the whole standard
  - training
  - biosecurity
  - site maintenance
  - records and reporting
  - traceability
  - regulations
- Education and training on the impacts should be mandatory for every certified farm
- Public reporting of sea lice site by site
- Should be a requirement to participate in region wide programmes on sea lice and diseases (mandatory in Norway)
- Sea Lice: How do we measureand handle them? One alternative may be the use of "cleaner" fish (wrasse).
- The SAD standard should include Area Management.
- Fallowing is missing.
- Evidence of a disease prevention strategy including area management should be included.
- Non therapeutics: should include functional feeds and provide evidence of a preventative health strategy in place and should include health risk management.
- For this:
- Fish health management plan, site specific
- Preventative strategies
- Therapeutants when required an integrated pest management approach (wrasse or cleaner fish).
- Standard on fish health management plan should include specific indicators.
- Evidence of effective fish health monitoring by company and clear criteria for the engagement of a veterinarian.

Criteria 5.1: Survival and health of farmed fish

- Should have a total allowed mortality rate per production cycle. If exceeded certification should be withdrawn
- All losses must be accounted for. This knowledge is not sufficiently available today
- Must include cause specific mortalities and resolution
- 5.1.4 is an area where information is lacking
- Compare number of fish stocked to number of fish harvested (reconciliation system)
- 5.1.3 How does this indicator add to the assessment of the impact?

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

- 5.2.2 Chemicals already undergo extensive trials before being approved, so indicator is inadequate.

Criteria 5.3: Therapeutic treatments

- Indicator5.3.3
  - Active ingredients: what is this getting to? Answer. A common unit to measure use throughout jurisdictions.
  - Amounts of treatments used should be public/published
  - This is proprietary and does not demonstrate good or bad fish health management.
- The word banned needs definition and should ideally be removed
- Antibiotic consumption per unit needs to be defined (what is meant by production)

Criteria 5.4: Resistance of parasites, viruses, and bacteria to medicinal treatments

- 5.4 can be excluded. Is a given (by law)
- 5.4.3: Scope of this is outside the farmers' control and is irrelevant if you've complied with 5.4.2.

Criteria 5.5: Biosecurity management

- 5.5 need certification of adequate cleaning and disinfection of facilities and equipment.
- Biosecurity protocols for farms, vessels, etc should be in place by the company as a whole.
- 5.5.3 is outside of scope of the standard and should be eliminated.
- 5.5.2 is irrelevant
- Biosecurity indicators must be included and monitored
- Risk assessment needs to be addressed and documentation of biosecurity protocols kept
- 5.5.5 Irrelevant if Fish Health Management plan and others are in place.
- Leave in 5.1.4, take out 5.5.5
- The point is to ensure the health of smolts and eggs: Where, when and how do you measure smolt health? The fish could leave the hatchery disease-free and be infected during transport.
- Eggs: after risk analysis, they should be quarantined.

Principle 6: Develop and operate farms in a socially responsible manner

- Wording changes –make the language in the backgrounder include the word negative as later on in the document
- How do social issues fit?
- Is the use of sustainable managed fisheries (for feed) a social issue?

Principle 7: Be a good neighbor and conscientious citizen

- Measure how the company deals with community complaints –is there a system in place?
- Policy on corporate social responsibility
- Commitment to investing in research
- Innovation
- Stakeholder engagement –very regionally specific
- Social auditing challenges –ILO based audits have a 90 to 95% failure rate
- Is this standard sustainable?