

# Aquaculture Facility Certification

## Salmon Farms

Best Aquaculture Practices  
Certification Standards, Guidelines



**Community • Environment • Animal Welfare • Food Safety • Traceability**

## BEST AQUACULTURE PRACTICES CERTIFICATION

The following Best Aquaculture Practices standards and guidelines apply to the cage and net pen production in marine waters of Atlantic salmon, *Salmo salar*; chinook salmon, *Onchorynchus tshawytscha*; coho salmon, *Onchorynchus kisutch*; and rainbow trout, *Onchorynchus mykiss*. Marine waters are defined as waters with average salinity greater than 25 ppt.

The BAP standards are achievable, science-based and continuously improved global performance standards for the aquaculture supply chain that assure healthful foods produced through environmentally and socially responsible means. They are designed to assist program applicants in performing self-assessments of the environmental and social impacts, and food safety controls of their facilities, and to lead to third-party certification of compliance, thereby eliminating the most significant negative impacts. For further information, please refer to the additional resources listed throughout this document.

BAP standards demand compliance with local regulations as the first step toward certification. However, not all regulations are equally rigorous in all aspects. For this reason, BAP standards set out requirements for documentation and procedures that must be in farm management plans, whether they are prescribed by local regulations or not. By so doing, they seek, where possible, to impose consistency in performance among facilities in different producing regions and to engage the industry as a whole in a process of continuous improvement.

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.

In common with ISO usage, these standards use the words “shall” to mean compliance is required and “should” to mean compliance is recommended. Auditable points are “shall” statements listed at the end of each standard.

To obtain BAP certification, applicants must be audited by an independent, BAP-approved certification body. To apply for certification, contact:

**Best Aquaculture Practices**

Two International Drive, Suite 105 – Portsmouth, New Hampshire 03801 USA

Telephone: +1-603-317-5000

Web: <http://bap.gaalliance.org> – E-mail: [bap@gaalliance.org](mailto:bap@gaalliance.org)

The audit consists of an opening meeting, a site assessment, the collection of necessary samples, a review of management records and procedures, and a closing meeting. All points in the standards shall be addressed. Any non-conformity raised during the evaluation is recorded by the auditor in the formal report as:

**Critical** – When there is a failure to comply with a critical food safety or legal issue, or a risk to the integrity of the program, the auditor immediately informs the certification body, which then informs the Best Aquaculture Practices office. Pending clarifications, failure to certify or immediate temporary suspension can ensue.

**Major** – When there is a substantial failure to meet the requirements of a standard but no food safety risk or immediate risk to the integrity of the program, the auditor notifies the certification body and records this in the report. Verification of the implementation of corrective actions shall be submitted to the certification body within 28 days of the evaluation. (Major non-conformities typically reflect issues with general policies.)

**Minor** – When full compliance with the intent of standards has not been demonstrated, the auditor notifies the certification body and records this in the report. Verification of the implementation of corrective actions shall be submitted to the certification body within 28 days of the evaluation. (Minor non-conformities typically reflect general housekeeping issues.)

BAP standards are developed by committees of technical experts following a process aligned to the FAO Technical Guidelines on Aquaculture Certification. See <http://bap.gaalliance.org/bap-standards/bap-standards-development/>.

## 1. Community

### Property Rights and Regulatory Compliance

Farms shall comply with local and national laws and environmental regulations, and provide current documentation that demonstrates legal rights for land use, water use, construction, operation and waste disposal.

#### Reasons for Standard

Regulations are needed to assure that farms provide pertinent information to governments and pay fees to support relevant programs. The BAP program requires compliance with applicable business-related laws and environmental, social and food safety regulations, including those concerning protection of sensitive habitats, effluents, operation of landfills and predator control, because it recognizes that not all regulations are uniformly enforced.

Some salmon farms and their support facilities may be sited in water bodies or on land to which farm owners do not have legal rights. These areas may be used by coastal communities for fishing, recreation, tourism and other uses. Unauthorized installation of farms can interfere with the use of resources by local communities.

#### Implementation

Regulations regarding the operation and resource use of farms vary significantly from place to place. Among other requirements, such laws can call for:

- business licenses
- aquaculture licenses
- land deeds, leases or concession agreements
- land use taxes
- construction permits
- water use permits or leases

#### Standards

- 1.1: Current documents shall be available to prove legal land and water use by the applicant.
- 1.2: Current documents shall be available to prove all business and operating licenses have been acquired.
- 1.3: Current documents shall be available to prove compliance with applicable environmental and other regulations for construction and operation.
- 1.4: Where applicable, current documents shall be available to prove compliance with Area Management Agreements or other local agreements to which the farm has committed. (See also Standard 2.7.)
- 1.5: Where applicable, current documents shall be available to prove compliance with laws protecting the resources of indigenous peoples and/or independent agreements the applicant may have made with them.
- 1.6: Where applicable, current documents shall be available to show compliance with the farm's own industry codes of practice.

- protection of sensitive habitats
- therapeutics use
- predator control permits
- protection of the rights of native peoples
- environmental impact assessments or reporting on fish health
- compliance with zoning or area management programs, where these are in place.

BAP auditors cannot know all laws and regulations that apply to salmon farming in all nations. Participating farms have the responsibility to obtain all necessary documentation for siting, constructing and operating their facilities, and make these available to auditors.

Assistance in determining these necessary permits and licenses can be sought from governmental agencies responsible for agriculture, environmental protection, fisheries, aquaculture, water management and transportation, as well as local aquaculture associations. Auditors shall also become familiar with the legal requirements within the areas they service.

The BAP program imposes repeated audits on participating facilities. It augments existing regulations that may require aquaculture facilities to perform environmental impact assessments before beginning construction and to comply with regulations during operation.

During the BAP site inspection, the representative of the farm shall present all necessary documents, including documents relating to local agreements such as Area Management Agreements, to the auditor. Farms must be in compliance with the requirements stipulated by the documents. In cases where governmental agencies have waived one or more permits, or the need for compliance with existing permits, proof of these waivers shall be available.

## 2. Community

### Community Relations

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

### Reasons for Standard

Some salmon farms may restrict access by local people to areas used for fishing or recreation. Farmers should find ways to accommodate these uses, if possible.

### Implementation

Participants in the BAP program shall be good neighbors and seek to cooperate with other rightful users of land and water to earn community acceptance. Farm management should communicate regularly with local leaders and respond helpfully to public requests for information.

Farms shall post signs that identify possible safety hazards and should provide barriers to entry by unauthorized persons where this is legal and practical. However, farm management should try to accommodate traditional uses of natural resources by cooperating with established local interests.

During facility inspection, the auditor may verify compliance with these standards through examination of maps that define public and private zones and concession areas, on-site inspection of fences and other barriers, and interviews with local people and farm workers selected by the auditor.

### Area Management Agreements

The BAP program strongly supports the concept of Area Management Agreements (AMAs) among farms to provide a means for communication with the local community and the coordination of production and environmental management within defined hydrographic areas. Where AMAs already exist, BAP-certified farms shall participate in such AMAs and be able to demonstrate compliance with the procedures they define.

### Standards

- 2.1: The applicant shall accommodate local inhabitants by not blocking access to fishing areas and other public resources. Where access is not direct, the applicant shall provide signage and a written access plan demonstrating consideration of biosecurity and employee and public safety.
- 2.2: The applicant shall clearly identify farm property lines and post signs that warn the public and staff of potential safety hazards.
- 2.3: The applicant shall demonstrate interaction with the local community to avoid or resolve conflicts through meetings performed annually or more often, committees, correspondence, service projects or other activities.
- 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 that are specific to the applicant's operation and provide details in writing of the alleged failing.
- 2.5: Where applicable, the applicant shall demonstrate dialogue with local native peoples and a process for conflict resolution with them under the laws governing their rights.
- 2.6: The applicant shall participate in or be working toward participation in an Area Management Agreement, and shall demonstrate compliance with the terms of such an agreement or a projected timeline for establishment of an agreement.
- 2.7: Where an AMA has not been established, applicants shall nevertheless demonstrate cooperation on matters of stocking, fallowing, fish health and biosecurity with BAP-certified farms within an area twice the regulatory minimum separation distance to an upper limit of a 5-kilometer radius. (See Sections 4 and 10.)

Boundaries for AMAs are defined in different jurisdictions by distance or hydrographical characteristics (tidal excursion), with work ongoing to improve precision. It is probable that definitions will evolve over time as better tidal models become available and more is learned about the mechanisms of effective farm separation. Therefore, the BAP program does not yet prescribe a single approach to defining management areas, only compliance with existing management area rules in countries where these are established.

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 among farms is not under the control of a single BAP applicant, the creation of, and/or setting of boundaries for an AMA, is not yet a requirement for initial BAP certification.

Nonetheless, 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 on progress during the BAP audit. If the timeline has not been met, the farm must provide documentary evidence to show why the failure was beyond its control.

Certified farms not within an AMA must also cooperate with other neighboring BAP-certified farms and work together as if part of an AMA to coordinate activities whenever AMAs are required by these standards. As a general rule, other certified farms within an area twice the regulatory minimum separation distance to an upper limit of a 5-kilometer radius of the applicant shall be considered neighboring.

## 3. Community

### Worker Safety and Employee Relations

Farms shall comply with local and national labor laws to assure adequate worker safety, compensation and, where applicable, on-site living conditions.

#### Reasons for Standard

Farm work is potentially dangerous because of the types of equipment employed and the nature of the work in and on water. Workers may not fully understand the risks at farms and safety instructions related to them.

Salmon farms may be located in remote areas, requiring that staff live on site for periods to provide security and respond to farm emergencies. Conditions of employment for salmon farm employees or subcontracted workers must reflect these special demands in addition to provision of fair wages and other employee benefits.

#### Implementation

At a minimum, certified farms shall provide legal wages, a safe working environment and adequate living conditions. Farm management must demonstrate that the facility complies with national or local laws governing the rights and conditions of employment of farm personnel, including casual labor and work by subcontractors. Efforts should be made to exceed the minimum requirements, because certified farms should be progressive and socially responsible.

Laws notwithstanding, the farm shall have a written employment policy, verified during the facility audit, that bans forced or bonded labor and employment of workers under 15 years old outside the existing International Labor Organization conventions and standards. Policies shall allow employees to organize collective bargaining under the respective nations' laws, and provide written employment contracts in the predominant language of the employees.

Policies shall enable employees to express grievances to company representatives without discrimination or harassment. Farms shall provide insurance or other means to pay wages to employees who cannot work because of injuries sustained at work and for fair and reasonable severance payments to employees who are made redundant.

Staff shall be given training on the work they are required to do, as well as on safety procedures, with allowance made as needed for workers whose first language is not the local language. Safety documents shall be available, and workers shall

be trained in first aid and be capable of addressing emergency response procedures.

Safety equipment such as goggles, gloves, hard hats and life jackets shall be provided when appropriate and kept in working order. A plan shall be available for obtaining prompt medical assistance for injured or ill workers.

Farms shall apply dive safety plans that require adequate training of staff divers and minimize daily dive frequency. Dives shall be conducted according to Defense and Civil Institute of Environmental Medicine tables or equivalent approved tables to reduce the risk of decompression illness to minimal levels.

Divers shall maintain procedural logs and maintenance records for diving equipment, which shall be audited at least monthly through a documented internal audit process. Written procedures and staff training for dealing with diving emergencies such as decompression sickness are also required.

Living quarters, if provided, shall meet local and national standards (e.g., water-tight structures, adequate space, heating/ventilation/cooling), and shall provide adequate clean washing/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 Section 8.)

For subcontractors who work on the farm, the subcontracting companies or individuals shall provide documents to prove they are legally licensed or registered to work in the relevant jurisdiction. Records of subcontracting shall be maintained, and individuals who work as subcontractors more than 100 hours in any month shall receive the same safety training provided to direct-hire employees. Individuals or companies contracted for diving work shall follow the same procedures as direct-hire employees.

During facility inspection, the auditor will evaluate whether conditions comply with labor laws. The auditor will also interview a random sample of workers to obtain their opinions about wages, safety and living conditions. Any discrepancies will be investigated.

#### Additional Information

##### Defense and Civil Institute of Environmental Medicine Diving Manual

Air Decompression Procedures and Tables  
<http://www.divetable.de/skripte/p125936.pdf>

#### Standards

3.1: The applicant shall meet or exceed the minimum wage rate and benefits required by local and national labor laws.

3.2: The applicant shall not engage in or support the use of child labor. The applicant shall comply with national child labor laws regarding minimum working age or ILO Minimum Age Convention 138, whichever is higher. ILO Minimum Age Convention 138 states the minimum age shall be 15, unless local law in developing nations is set at 14 – in accordance with developing nations' exceptions under this convention.

- 3.3: The employment of young workers above the minimum age but under 18 years old shall be in compliance with local laws, including required access to compulsory school attendance and any restrictions on hours and time of day.
- 3.4: Young workers above the minimum age but under 18 years old shall not be subjected to hazardous work that can compromise their health and safety.
- 3.5: All work, including overtime, must be voluntary. The facility shall not engage in any form of forced or bonded labor. This includes human trafficking, the holding of original identity papers, prohibiting workers from leaving the premises after their shift or other coercion intended to force anyone to work. Where the holding of original identity papers is required by national law, such papers must be immediately returned to employees upon request and readily available to them at all times.
- 3.6: The applicant shall abide by the national mandated work week, where applicable.
- 3.7: The applicant shall comply with national labor laws for pay, overtime and holiday compensation for hours worked beyond the regular work day or week, as well as laws governing workers compensation in the event of illness or injury sustained at work and for workers who are made redundant through no fault of their own.
- 3.8: Applicants that have farms in remote locations that require employees to live and work at the farm for prolonged periods shall have an adequate leave of absence policy – for example, two weeks of work at the farm followed by one week of leave.
- 3.9: The facility shall not require the payment of deposits, deduction from wages or withholding of pay that is not part of a legal contractual agreement with the employee and/or that is not provided for or permitted by national law.
- 3.10: The facility shall not make deductions from wages as part of a disciplinary process.
- 3.11: The applicant shall only employ legally documented workers, whether nationals or migrants.
- 3.12: The facility shall maintain all relevant documents that verify any contracted/subcontracted workers, whether contracted through a labor service or otherwise, are paid in compliance with all local wage, hour and overtime laws.
- 3.13: All labor, recruiting or employment services used by the facility must be licensed to operate by the local or national government as a labor provider.
- 3.14: The facility shall maintain all relevant documents that verify piece workers (those paid a fixed “piece rate” for each unit produced or action performed, regardless of time) are paid in compliance with local law, including regulations regarding equivalence to or exceeding minimum requirements for wages, hours, overtime and holiday pay.
- 3.15: The facility shall provide to all workers, whether hourly, salaried, piece-rate, temporary, seasonal or otherwise, prior to hire and during employment, written and understandable information regarding the terms of employment, worker rights, benefits, compensation, hours expected, details of wages for each pay period and facility policies regarding disciplinary actions, grievance procedures, authorized deductions from pay and similar labor-related issues. This information must be provided in the prevalent language of the majority of employees.
- 3.16: Where contracted/subcontracted or temporary workers are hired through a labor or employment service, the facility shall ensure that the labor or employment service provides the above information prior to and during hire, in appropriate languages, to ensure workers are aware of their rights and conditions of employment as described above.
- 3.17: Workers shall have the right to terminate their employment after reasonable notice.
- 3.18: The facility shall appoint a management person responsible for ensuring worker health, safety and training, who shall maintain a plan for obtaining prompt medical assistance for ill or injured workers.
- 3.19: The facility shall identify and eliminate or minimize any workplace health and safety hazards by conducting a thorough risk assessment. This includes a requirement for accident investigation.
- 3.20: Workers shall have the right to collective bargaining, or at least one employee shall be elected by the workers to represent them to management.
- 3.21: There shall be a written worker grievance process, made available to all workers, that allows for the anonymous reporting of grievances to management without fear of retaliation.
- 3.22: The facility shall provide for equal opportunity with respect to recruitment, compensation, access to training, promotion, termination and retirement.
- 3.23: The facility shall treat workers with respect and not engage in or permit physical, verbal or sexual abuse, bullying or harassment.
- 3.24: If provided, employee housing shall meet local and national standards (e.g., water-tight structures, adequate space, heating/ventilation/cooling), and shall be free of accumulated trash and garbage.
- 3.25: Safe drinking water shall be readily available to employees. If meals are provided, they shall be wholesome and commensurate with local eating customs.

- 3.26: Running water, toilets and hand-washing facilities shall be readily available to employees.
  - 3.27: In the event of accidents or emergencies, the applicant shall provide basic medical care, including access to or communication with medical authorities. Additionally, first aid kits shall be readily available to employees, and any expired content shall be replaced.
  - 3.28: The applicant shall provide training in general health, personal hygiene and safety (including aquatic safety and the use of boats and associated equipment), first aid and contamination risks to all employees. Safety documents shall be available in a language understood by the workforce.
  - 3.29: Employees shall be appropriately licensed to drive or use equipment for which public licenses are required, and a list of such licensed employees and copies of their licenses shall be available for inspection.
  - 3.30: An emergency response plan shall be prepared for serious illnesses or accidents that outlines the timely evacuation of personnel from remote locations, if necessary, due to medical emergency, natural disaster or other major problem.
  - 3.31: Select workers shall be made familiar with details in emergency response plans and trained in the first aid of electrical shock, profuse bleeding, drowning and other possible medical emergencies. One of these workers shall be present on site whenever untrained personnel are present.
  - 3.32: Protective gear and equipment in good working order shall be provided for employees (e.g., life vests for workers on farms and in boats, eye protection for welding, gloves for shop work, boots for wet areas). Auditor to verify deployment.
  - 3.33: Electrical pumps and aerators shall be wired according to standard safe procedures. Machinery shall have proper driveshaft and/or drive belt safety guards.
  - 3.34: The applicant shall comply with laws that govern diving on aquaculture farms and develop a written dive safety plan that requires diver training and the maintenance of logs that document procedures, safety-related incidents and equipment maintenance. Limits for time under water and the frequency of ascents during the dive day shall be established and monitored according to Defense and Civil Institute of Environmental Medicine tables or equivalent approved tables.
  - 3.35: The applicant shall provide written procedures and staff training for handling diving emergencies and shall audit records and procedures monthly using a documented audit process. Emergency response equipment for divers shall include oxygen for resuscitation.
  - 3.36: Subcontractors who provide services such as diving, harvesting, environmental monitoring and system inspection and maintenance to the applicant shall provide documents to prove they are legally licensed to do such work and shall be required to comply with the applicant's relevant health and safety procedures. Records of subcontract services used shall be maintained and made available for inspection.
  - 3.37: Individuals who work as subcontractors more than 100 hours in any month shall receive the same safety training provided to direct-hire employees.
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## 4. Environment

### Sediment and Water Quality

**Farms shall be located and operated in such a way that they minimize negative impacts on sediment quality outside a defined sediment impact zone, or on water quality within the general vicinity of the farm.**

#### Reasons for Standard

Salmon farms have the potential to cause environmental harm due to sediment accumulation under farms. The causes include settlement of feces and uneaten food, detachment of fouling debris from nets, or sloughing of antifouling materials. (See Section 8.) Salmon facilities can also affect water quality near the farm due to excretion of metabolic wastes by the fish. The occurrence or severity of these effects varies greatly among locations and regions, and sediment monitoring is the most practical means of detecting change.

Water column and benthic effects can be caused by other aspects of farm operation, such as the use of medicines and chemicals to treat fish for parasites or diseases, careless waste disposal or spills of fuel and toxic chemicals. These matters are addressed in Sections 8 and 10.

### Implementation

#### Sediment

Farms are usually located following a hydrographic, biological and physical study of the site to determine that farm operations will not have significant negative impacts on animal populations that comprise the benthos under or near the farm. Then "allowable" benthic impacts are set as conditions in the operating permits for the farm, which are defined in terms of one or more of several chemical properties of the sediments. Sometimes these are then correlated with species density and diversity determinations, which are based on prior knowledge of local sediment biology or analysis of sediment reference samples collected from the farm location.

Farm permits and/or local regulations usually define an allowed "sediment impact zone" or "allowable zone of effect," sometimes also called the "footprint of deposition," and prescribe monitoring protocols to check it. Because biological sampling of sediments requires special expertise and is time-consuming and expensive, chemical sediment properties are usually used as leading indicators of sediment condition. Biological sampling is only required in some jurisdictions if an indicator trigger point is exceeded.

Chemical indicators used for this purpose include sulfide, REDOX potential, total organic carbon or total volatile solids, or visual inspection with documentation by video. Some methods are better suited to some environments than others.

For example, sulfide determination works well in silt or clay sediments containing up to 50% sand, as does determination of total organic carbon. Above this level of sand, an indicator such as total organic carbon works better. On hard bottoms with over 10% gravel, visual recording by video is best because grab sampling is impossible, and many such sea bottoms are erosional in nature, not depositional.

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 these standards, only that whatever method is used shall be undertaken using standard methods of sampling and analysis that conform to generally accepted international standards.

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 farms meet or exceed benthic standards required by operating permits at current production levels.
- 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 that in the expert's opinion (given without liability), the farm can meet or exceed the benthic standards required by its operating permits at current or proposed production levels. This opinion shall be verified by reference to sampling results at the next audit.
- Provide documents to show that sediment quality was determined using generally accepted sample collection and analytical methods.
- 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 (see Introduction) and which may be used in future GAA-sponsored research. 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.

### **Regions Where Sediment Monitoring Is Not Required**

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 that requires 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. 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 build-up of organic matter and copper, if copper-based antifoulants are used, 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: Section 10 requires cyclical stocking and harvesting 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 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 40-meter boundary.
- 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 and where there is no other salmon production.
- Demonstrate by statistical analysis of the results that there is no organic build-up or increase in the concentration of copper 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 Salmon Database, as required for other farms above.

### **Water Quality**

Farm operation effects on water quality are usually measured using internationally standardized methods, but these effects are dependent on temporal and local factors, and are often transitory.

Most farms measure dissolved-oxygen levels frequently or continuously to ensure the well-being of their fish, but determination of metabolites such as phosphates and ammonia is not considered necessary for BAP certification for a single farm, except where this is already required as a condition of the farm's operating permits.

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 (Section 2).



## 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. 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 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 (see Introduction) 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 be undertaken in cooperation with existing BAP-certified farms.

## Additional Information

### Marine Farm Planning

Tasmanian Department of Primary Industries, Parks, Water and Environment  
<http://dppwwe.tas.gov.au/sea-fishing-aquaculture-marine-farming-aquaculture/marine-farming-planning-review-panel>

## Standards

- 4.1: The applicant shall provide documents that describe local standards for benthic impacts under salmon farms, which shall include the benthic indicator "trigger level" above which the farm would not be in full compliance with the local standard, where this is clearly defined, or with its intent where it is not clearly defined.
- 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 4.1, its operating permits and/or 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.
- 4.4: For farms in countries where sediment monitoring is not required and/or a sediment impact zone is not defined as a condition of the farms' operating permits, the applicant shall write and implement a monitoring plan consistent with the provisions under Implementation above.
- 4.5: Monitoring of sediment conditions shall be undertaken at the time of peak feeding during the production cycle and shall be conducted according to the requirements of the farm's operating permits or its own plan in countries or regions where sediment monitoring is not required, and as specified in the implementation requirements.
- 4.6: Sediment sampling and analysis performed as part of the monitoring program shall be conducted according to methods generally accepted for such use in the region in which production is occurring.
- 4.7: The results of sediment monitoring shall be reported to and approved by the appropriate regulators. Where regulatory approval is conditional upon implementing a program of remedial action, this shall have been implemented and completed to show compliance with 4.1.
- 4.8: Data that will enable the farm's feed-based carbon and nitrogen discharges 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. (See Introduction.)
- 4.9: 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 Section 2.)

## Salmon Farm Site Inspection Checklist

British Columbia Salmon Farmers  
and Province of British Columbia – 2001  
[http://www.al.gov.bc.ca/fisheries/aqua\\_report/2001/appendix2.pdf](http://www.al.gov.bc.ca/fisheries/aqua_report/2001/appendix2.pdf)

## Guide to the Assessment of Sediment Condition at Marine Finfish Farms in Tasmania

C. Macleod and S. Forbes (editors)  
Tasmanian Aquaculture and Fisheries Institute  
University of Tasmania  
Hobart, Tasmania, Australia

## Code of Good Practice for Scottish Finfish Culture

Scottish Salmon Producers Organization  
<http://www.scottishsalmon.co.uk/cogp>

## 5. Environment

### Fishmeal and Fish Oil Conservation

**Farms shall use feeds and feed ingredients produced by responsible methods, accurately monitor feed inputs and minimize the use of fishmeal and fish oil derived from wild fisheries.**

#### Reasons for Standard

The majority of feeds manufactured for use in aquaculture contain fishmeal and fish oil as protein and lipid sources. Although fishmeal and fish oil are renewable resources derived primarily from populations of small fish that are not generally utilized for direct human consumption, there are limits to the amounts of these products the world's oceans can supply.

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. Fishery-based ingredients from wild sources should come from responsibly managed fisheries and shall comply with the requirements of standard 3 of the BAP feed mill certification standards.

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. More efficient feed conversion also has a direct beneficial impact on water quality and limits the release of excess nutrients to the environment.

#### Implementation

Aquaculture feeds are typically manufactured at commercial facilities and delivered to farms. Farmers shall obtain feed from suppliers that provide reliable information on the crude protein and fishmeal and fish oil content in the feeds. In addition, all BAP-certified farms shall obtain documents from their feed suppliers that list the type and inclusion rate of all non-marine ingredients used at inclusion rates over 10%. Farmers shall record the characteristics of all feeds used, the total amounts of each feed used each year and the total annual fish production.

To promote the responsible sourcing of marine ingredients, the applicant shall obtain feed from a BAP-certified feed mill or a feed mill that declares and documents compliance with BAP feed mill standards 3.1 and 3.3. These standards address sourcing policies on marine ingredients, covering traceability for species and origin, and the exclusion of any species designated on the IUCN Redlist as endangered or critically endangered.

The BAP feed mill standards require that after June 2015, for fishmeal and fish oil derived from reduction fisheries, at least 50% (calculation based on mass balance) shall come from sources that are either certified by the Marine Stewardship Council (MSC) or to the International Fishmeal and Fish Oil Organization Responsible Supply standards (IFFO RS).

Alternatively, where MSC- or IFFO RS-certified fishmeal and fish oil are not produced nationally, the above minimum

percentage can comprise material from active approved improvers programs as verified by IFFO (<http://www.iffo.net/node/493>), the Sustainable Fisheries Partnership (<http://fisheryimprovementprojects.org/view-fips/>) or World Wildlife Fund (<https://sites.google.com/site/fisheryimprovementprojects/home>). This 50% target will be periodically reassessed with the ultimate goal that all fishmeal and fish oil are derived from certified sources.

#### “Fish In:Fish Out” Ratio

The so-called “fish in:fish out” ratio, the calculation of which is explained below, is one of several means of measuring the ecological efficiency of an aquaculture system. It compares the amount of fish consumed by the system (usually in the form of fishmeal and fish oil) with the amount of fish produced.

BAP applicants shall estimate this ratio for each year class of fish once it has all been harvested. This is done by estimating the equivalent amount of whole fish (wet weight) eaten in the form of fishmeal and fish oil by each year class of fish and dividing it by the weight of whole fish harvested from the year class. This is further explained in Equations 1 and 2 below.

Estimation of the equivalent amount of whole fish in the feed fed shall be made based on data provided by the feed supplier on the transformation yields to fishmeal and fish oil for the industrial fish used. In the absence of such information, the equivalent amount of whole fish shall be calculated by assuming transformation rates of 22.5% and 5.0% for marine protein and marine oil, respectively.

BAP-certified salmon producers shall obtain fish in:fish out ratios of 1.5 or less.

#### Fish In:Fish Out Calculation

First, farmers must estimate the feed-conversion ratio (FCR), the amount of feed needed to produce a unit weight of the culture species. Farms shall calculate and record the FCR for each year class using the following equation, then apply that value in Equation 2 for the fish in:fish out ratio:

##### Equation 1

Feed-conversion ratio (year class) = Total annual feed use (mt) ÷ [Total harvested fish weight – weight of smolts (mt)]

##### Equation 2

Fish in:fish out ratio = Feed fish inclusion factor of 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 (%)]

The inclusion levels in Equation 2 shall include any meal or oil derived from wild-caught fish, squid, krill, mollusks or any other wild marine animals. However, they shall exclude meal or oil derived from fishery by-products such as trimmings, offal and squid liver powder, and aquaculture by-products such as shrimp head meal.

To illustrate the fish in:fish out (FIFO) calculation, consider a salmon feed that contains 12.0% fish oil and 20.0% fishmeal, and assume a yield of fishmeal from wild fish of 22.5% and yield of fish oil from wild fish of 5.0%.

Feed fish inclusion factor =  $(12.0 + 20.0) \div (22.5 + 5.0) = 1.16$

Thus, for an FCR of 1.2, FIFO =  $1.16 \times 1.2 = 1.40$ .

## Additional Information

### Best Aquaculture Practices Feed Mill Standards

<http://bap.gaalliance.org/wp-content/uploads/sites/2/2015/02/bap-feedmill-714.pdf>

### FAO Code of Conduct for Responsible Fisheries

<http://www.fao.org/docrep/005/v9878e/v9878e00.HTM>

### IFFO Global Standard for Responsible Supply

<http://www.ifo.net/system/files/IFFO%20RS%20Standard%20Issue%201.6%20Eng%20June%202014.pdf>

### Fish In:Fish Out Ratios Explained

Andrew Jackson – 2009

[http://www.ifo.net/system/files/EAS%20FIFO%20September2009%202\\_0.pdf](http://www.ifo.net/system/files/EAS%20FIFO%20September2009%202_0.pdf)

### The State of World Fisheries and Aquaculture

FAO Fisheries and Aquaculture Department – 2012

<http://www.fao.org/docrep/016/i2727e/i2727e00.htm>

## Standards

- 5.1: The applicant shall source feed from a BAP-certified feed mill or a feed mill that declares and documents compliance with the BAP feed mill standards criteria for fishmeal and fish oil conservation.
- 5.2: Documents from feed suppliers shall be available that assure 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.
- 5.3: The facility shall record the characteristics of all feeds used, and for each year class, shall record the total amounts of each feed used and the total fish production.
- 5.4: The facility shall calculate and record a feed-conversion ratio for each year class.
- 5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for each year class harvested.

## 6. Environment

### Control of Escapes

**Salmon farms shall take all practical steps to prevent escapes and minimize possible adverse effects on aquatic wildlife if escapes occur.**

### Reasons for Standard

Salmon can escape from farms under a number of circumstances. Typically, escapes occur when holes develop in nets due to wear and tear, collisions with boats, human error or attack by large predators. Damage can also occur during severe weather or from vandalism or robbery, when nets are damaged or cut, leading to substantial losses. Escapes sometimes happen when fish are removed from the water for grading or harvesting, or if net meshes are too large for the smallest fish stocked in the cages.

Escapees can affect wild salmon and other wild fish by competing with them for food and/or habitat, or by transmission of disease. When the escaped fish are the same species as wild salmon in the area, they can interbreed and cause changes in genetic population profile.

### Implementation

#### Fish Containment Plan

Applicants shall have a written Fish Containment Plan that includes provisions stipulated in the farm's operating permits as well as the provisions below, if not so stipulated. The plan

shall have three parts and include the following elements:

- Escape prevention
- Dealing with known or suspected escapes
- Inventory accounting procedures.

#### Escape Prevention

- 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 third party that confirms the farm structure design and installation are appropriate, given the 10- and 50-year site conditions estimated in the site classification.
- Documents that show the farm's moorings were installed according to the manufacturer's and/or marine engineer's specifications.
- A site risk analysis updated at least annually that identifies the potential and actual causes of fish escapes, determines their relative likelihood of occurrence or recurrence at the farm site, and identifies critical control points for effective escape risk monitoring, escape risk reduction and response to escapes by farm staff.
- Procedures based on the risk analysis that include management protocols and actions designed to monitor escape risks, reduce them when identified and respond to escape events in a timely and effective manner. The efficacy of these measures shall be verified and documented through the year.
- Procedures that require the main surface components of the system to be inspected by qualified inspectors

at least annually and repaired or replaced as needed. The sub-surface components must be inspected and replaced, as needed, at least every two years or between each crop cycle, whichever is shorter. Equipment shall be replaced as needed.

- Net inventory management procedures that track the ages of all nets on the farm or in storage, and provide strength tests on all nets between crops or every two years, whichever period is shorter. Nets shall be retired when their strength is below levels specified in local regulations or, where there are none, below the manufacturer's or supplier's recommendations.
- Cage inspection procedures that ensure all operational nets are surface checked for holes at least weekly and checked sub-surface at least every four weeks. Nets and cage superstructure shall be checked for holes and other indications of structural damage after risk events such as storms or big tides.
- Predator deterrence procedures that minimize the risk that predators can make holes in nets. (See Section 7).
- Boat equipment that includes guards on propellers and staff training procedures that minimize the risk of contact between boats and farm nets. (See Section 3.)
- Procedures and equipment consistent with local Coast Guard rules to warn non-farm marine traffic of the farm's presence.
- Procedures for handling live fish to prevent "spillage."
- A training program for all staff, which shall be part of their initial training, on all procedures in the Fish Health Containment Plan.

## Known and Suspected Escapes

- BAP applicants shall maintain equipment for attempted recapture and have written procedures for its use in situations where it might work. The procedures must enable rapid response, subject to legal constraints on the types of equipment that can be used.
- If an escape is known or suspected to have occurred, the cause shall be investigated immediately, and steps shall be taken to correct it. These actions shall be documented in farm records.
- If, after investigation, there are grounds for believing that an escape occurred, the fish remaining in the cage or cages shall be counted, if and/or when water and welfare indicators (Section 9) indicate this can be done without causing excessive distress to the fish, and any loss of inventory shall be recorded.
- 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. The escape shall be reported immediately to the regulator with BAP and the certifying body 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 the escape(s), and recommend corrective action where

these are matters the applicant can reasonably be expected to control. Reinstatement shall also be subject to proof presented by the applicant that corrective action has been taken.

- Details of known escapes shall be collected for possible future entry to the BAP Salmon Database (see Introduction) and shared with other farms in an AMA, where such an agreement is in place, and with BAP-certified farms in the area. (See Section 2.)
- Known escapes shall also be reported to the regulator, proof of which shall be maintained in farm records

## 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.
- After a year class of smolts is fully stocked, the number shall be recorded, and a projection shall be prepared of the number of fish expected to be harvested from it, based on the number of smolts received and taking into account 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  $\pm 3\%$  that cannot be explained shall prompt a secondary audit investigation at the applicant's expense to determine the cause, and, if a satisfactory explanation is not found, shall result in loss of BAP certification.

## Limiting Impacts of Escapes

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 the situation 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 these BAP guidelines, "wild" salmonids are defined as those naturally spawning salmonid populations that have had little or no direct stocking of hatchery-reared fish for at least two generations.

## 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 2005 ICES Code of Practice on the Introductions and Transfers of Marine Organisms.

## 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.

## Technical Notes

Techniques to produce sterile salmon that cannot interbreed with local wild salmon if they escape are the subject of current research. This will be kept under review by the BAP program and its advisors, and may be a future requirement for certification.

Methods for marking fish so that farmed fish caught in the wild can be traced to their source are feasible, but difficult to use on a large scale. Nonetheless, such marking is a desirable goal and thus will also be kept under review as a possible future requirement for BAP certification.

## Additional Information

### B.C. Reg. 78/2002 Fisheries Act – Aquaculture Regulation

Pacific Aquaculture Regulation  
Fisheries and Oceans, Canada  
<http://www.gazette.gc.ca/rp-pr/p1/2010/2010-07-10/html/reg2-eng.html>

### Environmental Regulation for Aquaculture (RAMA)

#### Chile DS No. 320-01

[www.subpesca.cl](http://www.subpesca.cl)

### Generic Containment Management System

Maine Aquaculture Association – 2002

### ICES Code of Practice on Introductions and Transfers of Marine Organisms 2005

<http://www.ices.dk/publications/Documents/Miscellaneous%20pubs/ICES%20Code%20of%20Practice.pdf>

### Marine Fish Farms N.S. 9415

<http://www.standard.no/en/webshop/Search/?search=Marine+Fish+Farms+N.S.+9415+>

### Code of Containment for Culture of Atlantic Salmon in Marine Net Pens in New Brunswick

New Brunswick Salmon Growers' Association  
[http://0101.nccdn.net/1\\_5/338/2a8/3af/2008\\_NBSGA\\_Code\\_of\\_Containment\\_June\\_2008.pdf](http://0101.nccdn.net/1_5/338/2a8/3af/2008_NBSGA_Code_of_Containment_June_2008.pdf)

### Technical Requirements for Fish Farming Installations

Norwegian Ministry of Fisheries and Coastal Affairs  
[http://www.regjeringen.no/upload/kilde/fkd/bro/2005/0013/ddd/pdfv/255320-technical\\_requirements.pdf](http://www.regjeringen.no/upload/kilde/fkd/bro/2005/0013/ddd/pdfv/255320-technical_requirements.pdf)

### General Permit Atlantic Salmon Aquaculture

Maine Pollutant Discharge Elimination System Permit, Part II Special Conditions  
State of Maine Department of Environmental Protection – 2008  
<http://www.epa.gov/region1/npdes/permits/2008/finalmeg130000permit.pdf>

## Standards

- 6.1: If the farm operates in a jurisdiction where there are government regulations for fish containment, the applicant shall comply with the regulations and provide proof of so doing.
- 6.2: Local rules notwithstanding, the applicant shall demonstrate that the farm meets the BAP procedural, performance, documentation and reporting requirements for fish containment required by the Fish Containment Plan outlined under Implementation above, which shall include a classification of the farm site, an engineer's structural report, a mooring certification, an escape risk analysis, monitoring procedures that respond to the risk analysis, predator deterrence procedures, precautions related to the use of boats, fish handling procedures and inventory accounting procedures.
- 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 training certificates in employees' files and verified at audit by a subset of interviews.
- 6.4: If an escape is suspected or has occurred since the last audit, the applicant shall provide reports and farm records to show that these incidents were dealt with in a manner consistent with the Fish Containment Plan, including deployment of recapture equipment where allowed, investigation of the cause and a report to the regulator.
- 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 the 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  $\pm 3\%$  or less after accounting for known losses.
- 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.
- 6.8: The applicant shall provide documents that prove the species of salmon farmed is approved for farming in that country and that the stocked fish are not transgenic. Where the species farmed is not native or not already farmed, further documents shall be provided to demonstrate that approval for farming is based on the 2005 ICES Code of Practice on Introductions and Transfers of Marine Organisms.

## 7. Environment

### Predator and Wildlife Interactions

**Farms shall manage physical interactions with wildlife and not reduce the biodiversity of ecosystems.**

#### Reasons for Standard

Salmon farms are located along mostly undeveloped coastlines, where abundant marine wildlife is common. Wildlife species may interact with salmon farms because they are intimidated by the farms' presence or because they are attracted to farms as habitat, somewhere to perch or hide, or a place to find food.

For this section, these interactions are defined as "physical interactions," distinguished from the "biological interactions" with wild salmon addressed in Sections 6 and 10. Many physical interactions with wildlife are harmless, but in some cases, they can injure wildlife through entanglement and drowning, or damage farm equipment. Wildlife in areas designated as "critical" or "sensitive" habitat can be particularly vulnerable to adverse interactions, and salmon farms may be required to adopt special precautions if they are permitted to locate in such an area.

Wildlife species that interact with salmon farms include but are not limited to diving birds that attack small fish through net meshes, predatory birds that take fish from the surface and small marine mammals such as otters that enter cages and kill fish. Large marine mammals may attack fish from the outside and damage nets. Certain fish species may chew on nets and create holes.

#### Implementation

Applicants shall have a written Wildlife Interaction Plan (WIP) that includes provisions stipulated in local laws and the farms' operating permits, as well as the requirements itemized below, if not so stipulated. The WIP shall describe area wildlife and include copies of important, relevant reference documents, where these exist. It shall also highlight specific points of concern or ecological sensitivity, and itemize policies and procedures the farm will follow to accomplish the goal of avoiding harm to wildlife while protecting farmed fish and farm infrastructure.

The BAP program strongly encourages farms to employ humane, non-lethal measures for predator exclusion and/or control, even when lethal methods are permitted. Farms shall record all predator mortalities (species and numbers). All marine mammals, seabirds and species listed as "critically endangered" or "endangered" on the International Union for Conservation of Nature Red List or protected by local or national laws shall not be subject to control by any means except physical exclusion, unless human safety is at risk or an independent environmental audit provides justification for such control, and specific written permission for an alternative means of control has been granted by the regulator with jurisdiction.

Although there are cultural and legal differences among countries regarding the protection of wildlife, particularly Pinnipeds, BAP-certified salmon farms must do all they reasonably can to not harm wildlife, irrespective of local customs.

The WIP shall include but is not 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, updated where necessary to show wildlife established after the farm was started, shall also be included.
- 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 recording and reporting such observations to farm management and to members of the public who have expressed interest.
- Designation of one staff member 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 small 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 acoustic harassment devices used are approved by regulators through a review of environmental impacts with specific reference to endangered, protected, threatened or cetacean species in the area. Such devices shall not be deployed if the review shows they can 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 may be required for submission to the BAP Salmon Database for future use in GAA-sponsored research. (See Introduction.)
- Procedures that state lethal methods shall only be used after all non-lethal methods are attempted and must be legally approved.
- Procedures that make it clear deliberate lethal controls on species classified as endangered or threatened are not to be used except under exceptional circum-

stances, such as risk to human life, and then, if not an emergency, only after specific written authorization is obtained from regulators.

- Procedures for regulatory authorization, implementation and reporting of lethal control measures when these are deemed necessary.

## Additional Information

**International Union for Conservation of Nature  
Red List of Threatened Species**

<http://www.iucnredlist.org>

## Standards

- 7.1: If the farm operates in a jurisdiction with government regulations related to interactions with wildlife and predator control, the applicant shall comply with the regulations and provide proof of so doing.
- 7.2: Local rules notwithstanding, the applicant shall demonstrate that the farm meets the BAP procedural, performance, documentation and reporting requirements for a written Wildlife Interaction Plan, as described in the implementation requirements above, which shall include a list of local species of concern, expert wildlife interaction risk assessment, procedures to respond to risks and a description of the farm's passive deterrence measures and inspection procedures.
- 7.3: The applicant shall provide site maps or other current documentation that show the farm is not within geographic areas officially designated "critical" or "sensitive" habitat (or equivalent). If such documentation is not available, the applicant shall provide proof of regulatory authorization of the farm site and operations, as well as a risk assessment of farm/wildlife interactions and related procedures.
- 7.4: Farm employees shall be familiar with the provisions of the WIP and trained in aspects of it that they may be called upon to implement.
- 7.5: 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.
- 7.6: If lethal control is necessary and justified, the applicant shall designate a member of staff to take the action, provide training as needed in humane slaughter methods and only use methods that are legally approved.
- 7.7: The applicant shall record, and report when required, the species and numbers of all avian, mammalian and reptilian predator mortalities, including accidental mortalities.
- 7.8: 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, and if they are legally approved and/or permitted for use.
- 7.9: The frequency of incidences of active deterrence in which wildlife is affected shall be reduced over time unless extenuating circumstances can be demonstrated.

## 8. Environment

### Storage and Disposal of Farm Supplies

**Feed, fuel, lubricants and chemicals shall be stored and disposed of in a safe and responsible manner. Paper and plastic refuse shall be disposed of in a sanitary and responsible way.**

### Reasons for Standard

Modern salmon farming uses feed that is susceptible to spoilage and infestation by vermin and pests unless stored properly. Farms use fuel, oil and grease to power and lubricate boats, pumps, aerators and other mechanical devices. Some farms may use parasiticides and antifoulants. Other products employed include paints, disinfectants and detergents.

Fuels and other chemicals are highly flammable and/or explosive, and parasiticides and antifoulants are toxic. They shall therefore be considered potential hazards to workers.

Spills or careless disposal of petroleum products and chemicals can affect aquatic organisms and other wildlife in the immediate vicinity, and result in water pollution over a wider area.

Farms generate waste that can cause pollution, odors and human health hazards when not disposed of properly. Human food scraps, out-of-date feed and other organic waste can attract scavengers.

Empty plastic bags and other containers used for feed, fertilizer and other materials do not decompose quickly. They can be a hazard to animals that become entangled in them or ingest them.

These wastes may be stored prior to disposal at a land base from which the farm is supplied, as well as transported on boats and barges to and from the farm. Safe, responsible transport, storage, handling and disposal of these materials are necessary at all times.

Procedures for the collection and sanitary disposal of dead fish recovered from the net pens are described under biosecurity procedures in Section 10.

## Implementation

Applicants shall have a written Materials Storage, Handling and Waste Disposal Plan (MSHWDP) that includes provisions stipulated in local laws and the farms' operating permits, as well as the following requirements, if not so stipulated:

- Procedures for the sanitary storage and handling of feed and its protection from vermin.
- A current inventory of all hazardous materials used and wastes stored and/or disposed of by the farm.
- Availability of material safety data sheets on site for all hazardous materials in the inventory.
- Procedures for the storage, transport, handling, labeling and use of fuel, oil, chemicals and other potentially toxic materials used on the farm that limit the risk of accidental spills and release into the environment. Secondary containment shall be provided for individual or multiple fuel storage tanks. The containment volume shall be equivalent to the total stored volume plus 10%.
- Refueling, maintenance and record-keeping procedures for all equipment that uses oil or fuel in order to prevent leaks or spills and ensure that used oil is sent to an approved handling facility.
- Procedures for the collection, storage and disposal of trash, garbage, refuse and other waste materials.
- Procedures and the necessary materials and equipment for emergency containment and cleanup of spilled materials.
- Procedures for washing nets treated with copper or other toxicant-based antifouling materials. Nets treated with antifoulant that is deemed 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.

- Procedures for the sanitary storage and disposal of human waste (black water).
- Procedures for recycling waste, where this is feasible.
- Procedures for the safe disposal of materials deemed surplus or out of date, including medicated feed.
- A written waste reduction plan for measuring and recording waste volumes and how such volumes will be reduced by recycling or other means over time.
- The waste reduction plan shall include a program to test alternatives to the use of toxicant-based antifoulant paints on farm nets with the goal of reducing release of toxicants to the environment, especially toxicant particles that can accumulate in marine sediments.

Note: The use of toxicant-based antifoulants will not be allowed at BAP-certified farms once the utility of alternatives is fully established. This will be a priority consideration at the next review of these standards.

## For Additional Information

### USDA NRCS Guide Sheet No. 701

Spill Prevention Control and Countermeasures  
<http://efotg.sc.egov.usda.gov/references/public/AL/G14Generaloperationsandworkersafety.pdf>

## Standards

- 8.1: The applicant shall have a written Material Storage, Handling and Waste Disposal Plan that includes the BAP requirements for proper handling and disposal as outlined in the implementation requirements above and be able to demonstrate compliance with it.
- 8.2: Farm staff shall be familiar with the MSHWDP and trained in aspects of it they may be required to implement. This will be tested at audit by interview.
- 8.3: Feed shall be stored so that it is protected from spoilage or infestation by pests and vermin.
- 8.4: An inventory shall be kept of all hazardous materials or wastes (chemotherapeutants and materials that are hazardous to people) stored on or disposed of by the farm.
- 8.5: Material safety data sheets shall be available for all hazardous materials.
- 8.6: Fuel, lubricants and chemicals shall be labeled, stored and disposed of in a safe and responsible manner and marked with warning signs.
- 8.7: Precautions shall be taken to prevent spills, fires and explosions, and procedures and supplies shall be readily available to manage chemical and fuel spills or leaks.
- 8.8: Garbage from housing and food waste shall be retained in water-tight receptacles with covers to protect contents from insects, rodents and other animals.
- 8.9: Garbage and other solid waste shall be disposed of in compliance with local regulations and shall avoid environmental contamination.
- 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 shifting from the use of antifoulants to in situ net cleaning, copper-based antifoulant-treated nets may be cleaned in situ if the nets have first been cleaned ashore by approved methods (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 a program to test alternatives to the use of toxicant-based antifoulant paints on farm nets.



## 9. Animal Health and Welfare

### Health and Welfare

**Producers shall demonstrate that all operations on farms that involve fish, including “cleaner fish” if used, are conducted with animal welfare in mind. Employees shall be trained to provide appropriate levels of husbandry and care.**

#### Reasons for Standard

Fish can experience distress from various causes, including poor health, morphological deformities, transport, handling and water quality degradation, or at harvest. However, such distress can be limited and production efficiency enhanced by applying good husbandry techniques to avoid culture conditions that may cause needless harm to the fish.

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.

Various stages and circumstances in the salmon-farming process can cause distress to fish. These include the transport of smolts from hatcheries and handling during sampling, grading and counting, harvesting, holding before slaughter and slaughtering. Poor water quality conditions, such as those associated with low levels of dissolved oxygen, plankton blooms in surrounding waters or extreme water temperatures or temperature fluctuations, can cause fish to be distressed, both on the farm and in the wild.

Infectious diseases and parasite infestations, as well as treatments for them, affect fish. So, also, do rearing densities too high for the culture conditions and sudden environmental changes, such as bright lights, noise, net billowing and predator attacks.

#### Implementation

Fish should always be treated with care. The following good aquatic animal husbandry practices should therefore be applied and shall be overseen by a fish health professional as part of the Fish Health Management Plan (Section 10).

Farms shall provide facilities for holding and rearing fish that allow them to thrive. High-quality feed should be offered at regular intervals, although fasting periods are often needed to enable harvesting in hygienic conditions.

Farm staff shall regularly inspect the culture facility, noting water quality as well as the appearance and behavior of the fish, and report observations to management daily. Trained personnel shall follow up on reports of behavioral distress to determine the causes of problems and resolve them.

Behavioral indicators of ill health include near-the-surface swimming, segregation or deviation from normal schooling patterns, and weak feeding motivation. Fish may display

respiratory distress, such as rapidly pumping or permanently open opercula. Change in color, especially darkening, is another possible sign of several diseases, as well as distress.

Morphological abnormalities such as snout injuries, jaw deformities, cutaneous ulcers and poor fin condition or scale loss can also indicate poor rearing conditions. However, these physical signs are lagging indicators that can often be predicted by observing behavioral changes and taking appropriate preemptive action. When morphological abnormalities are present, their causes should be determined and corrected.

Dead fish should be regularly removed from cages and pens, and disposed of properly. Fish that are obviously impaired should be removed from their cages and euthanized in a humane fashion.

The farm shall have a written Water Quality Management Plan that includes:

- Frequent or continuous monitoring of dissolved-oxygen concentration and at least daily monitoring of water temperature and salinity.
- Monitoring for other aspects of water quality that may affect fish in the vicinity of the farm, including seasonal occurrences such as phytoplankton blooms.
- Training of staff on measuring temperature, dissolved oxygen and, where relevant, concentrations of harmful phytoplankton.
- A list of practical mitigation measures that can be used in the event of water quality problems, as well as available equipment and trained staff to deploy them rapidly.
- Provision for equipment to maintain and monitor dissolved-oxygen levels at 80 to 100 percent of saturation during live fish transport.

When fish are crowded for management purposes, the time shall be limited to one hour. Stocking densities shall be moderate and take into account local and temporal factors, such as fish size, water temperature, dissolved-oxygen levels and the hydrographic patterns of the farm.

Average farm stocking density shall not normally exceed 25 kilograms per cubic meter, but may be allowed to rise higher for up to 5 percent of the production cycle if the fish show other indicators of good welfare, such as low mortality, and if water quality is considered good, which would normally mean water temperature below 12 degrees C, dissolved oxygen above 80 percent saturation and little or no harmful algae present. Sudden artificial illumination or underwater noise, and other environmental disturbances shall be limited.

Fish shall be harvested and transported to processing plants or other markets in a manner that maintains temperature control and minimizes distress. Before slaughter, they shall be stunned instantly by humane means. Carbon dioxide asphyxiation shall not be used.

If fish are hauled live to a processing plant, transport must be implemented without undue delay, and the time and stock-

ing density controlled according to prevailing conditions. Dissolved-oxygen levels shall be maintained above 80 percent saturation, and when transporting in a closed system, safe levels of carbon dioxide shall be established and maintained. Transport density shall be determined by local conditions, and fish volume shall not exceed 15 percent of the water volume. These harvesting provisions shall apply equally to farm staff and subcontractors.

## For Additional Information

### Farm Animal Welfare Council Welfare Standards for Animals

<http://webarchive.nationalarchives.gov.uk/20121007104210/>  
<http://www.fawc.org.uk/freedoms.htm>

### RSPCA Welfare Standards for Farmed Atlantic Salmon

Royal Society for the Prevention of Cruelty to Animals – 2012  
<http://science.rspca.org.uk/sciencegroup/farmanimals/standards/salmon>

### FastFish Website

<http://www.imr.no/fastfish/en>

### Opinion on the Welfare of Farmed Fish at the Time of Killing

Farm Animal Welfare Committee

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/319331/Opinion\\_on\\_the\\_welfare\\_of\\_farmed\\_fish\\_at\\_the\\_time\\_of\\_killing.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/319331/Opinion_on_the_welfare_of_farmed_fish_at_the_time_of_killing.pdf)

## Standards

- 9.1: Fish welfare shall be overseen and reported on by a designated fish health professional.
- 9.2: The farm shall be located in waters where salmon would be expected to thrive, and farm facilities shall be clean and orderly.
- 9.3: Fish shall be fed feed made by a reputable feed company and subject to the requirements for documentation specified in Section 5.
- 9.4: Where weather conditions allow, 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 fish health professional and/or farm management.
- 9.6: When impaired fish and unwanted species are removed, their number, total weight and condition shall be recorded. They shall be killed by humane techniques, with the carcasses disposed of in a manner that ensures biosecurity and in accordance with applicable local and state regulations and/or the provisions of Section 8.
- 9.7: The applicant shall exercise care in handling fish and manage them within specified limits for crowding and time out of water, and limit other sources of outside disturbances.
- 9.8: The applicant shall be able to demonstrate compliance with a written Water Quality Management Plan described in the implementation requirements above that includes provisions for water quality monitoring, staff training, mitigation measures for poor quality and procedures for the monitoring and control of dissolved oxygen during fish transport.
- 9.9: The applicant shall apply stocking density criteria based on local conditions, which shall normally be at or below an average 25 kilograms per cubic meter, but may rise higher than this for 5 percent of the production cycle if the fish show other good welfare indicators, and water quality is good.
- 9.10: Fish shall be harvested and transported under conditions directed by the fish health professional and designed to minimize distress.
- 9.11: The applicant shall demonstrate that mortality rates during transport are monitored, with the numbers used to evaluate transportation methods with the aim of reducing losses.
- 9.12: Prior to slaughter, fish shall be stunned humanely.

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## 10. Animal Health and Welfare

### Biosecurity and Disease Management

**Farms shall operate with the aim of preventing infectious disease outbreaks, but when diseases or parasites infect farmed fish, diagnosis and treatment shall be carried out promptly and judiciously under the supervision of a fish health professional in a manner that minimizes impacts on the environment.**

### Reasons for Standard

Infectious disease outbreaks at farms imply increased risks for disease transmission to surrounding farm sites and, in some cases, wild fish populations. Diseases also show themselves through poor performance and suffering in the affected fish.

Precautions should be taken in salmon farming to reduce the likelihood of infection and clinical disease, and limit their impacts by appropriate treatment if they occur.

## Implementation

Biosecurity shall be carried out under the direction of a veterinarian or fish health professional with equivalent qualifications, who is accredited or licensed by the governing regulatory authority in the region/country and has the legal authority to prescribe the use of medicines. 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 operate at two levels: at the farm site and among neighboring sites and aquaculture establishments within a defined area. The second level requires the establishment of an Area Management Agreement in which salmon farmers coordinate their activities with neighboring farms. (See Section 2.)

Additionally, the fish health professional 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.

## 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:

- A plan for the cyclical production of fish that mandates a fallow period of at least eight weeks after the completion of harvesting and before restocking, and that is coordinated with neighboring BAP-certified farms and, where there is an established Area Management Agreement, with all farms in the AMA. (See Section 2.)
- Assurance that only smolts certified clinically healthy and free of diseases and parasites specified in applicable national fish health regulations are brought onto the farm.
- Vaccination of fish before they are brought onto a farm and revaccination, if needed, at the direction of the fish health professional.
- Cleaning and disinfection of all fish-handling equipment before it enters or leaves the farm.
- Management and/or limitation of “visiting” vessels from sites of higher or unknown risk, and a supplemental plan for increased oversight in the event of disease concerns.
- Disinfection or changes of footwear by all personnel entering or leaving the farm.
- Accurate recording of all fish movements and transfers to, from and within the farm.
- A requirement to move to the use of closed well boats when transporting fish, as methods and equipment become available.
- Procedures for the accurate and regular cage-by-cage recording, examination and sanitary disposal of dead fish recovered as “normal mortality” from cages.
- An alert status that defines extra precautions, checks on fish and increased vigilance if an occurrence of infectious disease is known or suspected in the region.

- A recovery and disposal plan for dead fish in the event of a mass kill, with available equipment in place and identified services that can be called on to help quickly.

## Diagnosis, Treatment

Written procedures for fish diagnosis and treatment shall include:

- Monitoring for endemic or locally identified parasitic, bacterial and viral infections, and recording of findings and actions taken, which may or may not be mandated by government.
- Guidelines on indicators for disease that direct farm staff as they tend fish or remove dead fish from the cages, and provide procedures for timely reporting if an indicator is observed.
- A written response plan to be followed by the fish health professional to ensure rapid diagnosis if disease is suspected, followed by prompt treatment.
- Written procedures based on current guidelines for best professional veterinary practices on how medicinal treatments with drugs, vaccines or anesthetics, and any non-medicinal use of chemicals (i.e., for disinfection or water treatment) shall be selected and administered in order to minimize risks to human health and the environment.
- Written procedures for recording withdrawal times to minimize the risk of residues remaining in the fish.
- Where possible and where the welfare of the fish will not be compromised by delay in treatment, a procedure for antibiotic sensitivity or resistance testing prior to each subsequent course of treatment with the same antibiotic and for recording of trends.

## Sea Lice

Farms shall comply with current national or regional rulings on sea lice to minimize parasite reproduction and optimize control. These may include setting limits for maximum levels of sea lice of different stages on the farm’s fish and participation in coordinated delousing in regions where such coordination arrangements are in place. Farms shall follow government advice on therapeutic use to prevent the build-up of resistance. When practical non-chemical treatments for sea lice are developed, their use may become a future BAP requirement.

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. The rules and management shall 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.

## For Additional Information

**OIE Aquatic Animal Health Code – Import Risk Analysis**  
[http://www.oie.int/index.php?id=171&L=0&htmfile=chapitre\\_import\\_risk\\_analysis.htm](http://www.oie.int/index.php?id=171&L=0&htmfile=chapitre_import_risk_analysis.htm)

## **Judicious Use of Antimicrobials for Treatments of Aquatic Animals by Veterinarians**

American Veterinary Medical Association  
<https://www.avma.org/KB/Policies/Pages/Judicious-Use-of-Antimicrobials-for-Treatment-of-Aquatic-Animals-by-Veterinarians.aspx>

## **Evaluation of Bay Management Area Scenarios for the Southwestern New Brunswick Salmon Aquaculture Industry**

B. D. Chang, F. H. Page, R. J. Losier, P. Lawton, R. Singh, D. A. Greenberg – 2007  
<http://www.dfo-mpo.gc.ca/Library/328479.pdf>

## **Final Report of the Joint Government/Industry Working Group on Infectious Salmon Anemia in Scotland**

<http://www.scotland.gov.uk/Uploads/Documents/JGIWGReport.pdf>

## **Protection, Control and Eradication Measures for High-Risk Disease in Aquaculture Regulation**

Chile, D. S. 319  
<http://www.subpesca.cl>

## **Responsible Use of Antimicrobials in Fish Production**

Responsible Use of Medicines in Agriculture Alliance – 2007  
<http://www.ruma.org.uk/guidelines/antimicrobials/long/fishantimicrobialguidlineslong.pdf>

## **Prudent Use Guidelines: A Review of Existing Veterinary Guidelines**

C. J. Teale and G. Moulin – 2012  
<http://www.oie.int/doc/ged/D11824.PDF>

## **Standards**

- 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 (see Section 2). The fish health professional shall be available in person or by phone at audit to answer questions. The applicant shall notify the certifying body if the fish health professional changes.
- 10.2: The applicant shall show that the designated fish health professional has the required licenses and accreditations to act in the farming region.
- 10.3: The applicant shall have written biosecurity and health management plans consistent with the implementation requirements, which shall include procedures for site following, cleaning of farm equipment, visitor and vessel hygiene precautions, sanitary disposal of dead fish, increased vigilance if disease is suspected, sea lice management procedures and plans for disposal in the event of a mass fish kill, and shall be able to demonstrate compliance with them.
- 10.4: The fish health professional 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.
- 10.5: Written procedures for the diagnosis and treatment of disease in fish shall include monitoring for endemic parasitic, bacterial and viral infections.
- 10.6: The applicant shall adequately train farm staff in applying these biosecurity and health management procedures.
- 10.7: All smolts brought into the farm shall be free from diseases and parasites specified in applicable national health regulations, and shall be vaccinated against diseases for which effective vaccines are available prior to stocking.
- 10.8: Observations by farm staff of disease indicators and resulting actions concerning disease diagnosis and treatment shall be recorded.
- 10.9: If used, drug treatments shall be based on authorizations by the fish health professional, who shall be guided by the FHMP and principles of best practice for the veterinary profession. The health professional shall prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations. (See also Section 11.)
- 10.10: Records shall be maintained for every application of drugs and other chemicals that include the date, compound used, reason(s) for use, dose, withdrawal time and harvest date. (See the Traceability requirement.)
- 10.11: The applicant shall record data on disease outbreaks and actions taken so this information can be made available to the BAP database for future GAA-sponsored research. (See Introduction.)
- 10.12: If the applicant is a member of an Area Management Agreement (Section 2), the farm shall demonstrate compliance with the fish health management requirements of the AMA or, if an AMA is not yet in place, that it coordinates fish health management activities with other BAP-certified farms in an area twice the regulatory minimum separation distance to an upper limit of 5 kilometers.
- 10.13: The applicant shall demonstrate compliance with national or regional rules designed to minimize parasite reproduction and optimize control.
- 10.14: The applicant shall accept that if the auditor has concerns about any aspects of how the FHMP is written or implemented, a second opinion can be sought from an independent fish health professional.

## 11. Food Safety

### Control of Potential Food Safety Hazards

**Farming practices shall prevent the introduction of potential consumer health hazards that could be encountered during consumption. Chemical residues and contaminants shall be controlled and kept below regulatory limits through good farming practices and regular monitoring. Antibiotics, drugs and other chemical compounds that are proactively prohibited in producing or importing countries shall not be used.**

#### Reasons for Standard

Farmed salmon can become contaminated at several stages in the farming process. Possible contaminants include medicinal residues in smolts and/or juvenile fish brought on the farm from outside sources with inadequate controls; microbial, chemical or other environmental contamination in the unlikely situation that a salmon farm is located close to a source of such contaminants; heavy metals or PCBs/dioxins in fish feed; residues of medicinal compounds used during the farming process; and lubricants, fuel, paints or other materials to which the fish might be exposed when they are harvested and transported to a processing plant. Fish can also become contaminated by unclean water and transport containers used during transit to processing plants or markets.

Residues of improperly applied therapeutic agents can accumulate in fish tissue and present a potential health hazard to humans. Therefore, certain compounds have been proactively prohibited and residue limits mandated for others. Irresponsible use of antibiotics can also threaten human health by leading to antibiotic resistance or impact the surrounding environment through accumulation of drug residues in the food chain.

Rarely, farmed salmon can become infested with certain parasites that are potentially transmissible to humans unless adequate control measures are taken.

#### Implementation

Farm sites shall be selected after review of possible sources of toxic materials in the area consistent with the BAP standards in Section 4. Where a potential contamination risk exists in the vicinity or may affect farm waters either from natural runoff or direct discharge, the farm shall check for that contaminant in the flesh of exposed fish on at least an annual basis.

To avoid possible contamination of fish, farms shall also:

- Require suppliers of smolts or juvenile fish to provide written assurance that the fish have been reared without the use of medicinals or substances that are proactively prohibited in food animals in the producing and importing country, and that the hatcheries in which they were produced were compliant with the regulations under which they operate.
- Require feed suppliers to provide written assurances that levels of heavy metals and pesticides in feed are below the limits set for these contaminants in the

countries in which they operate, and that ingredients are traceable to the source. (See Section 5).

- Require feed suppliers to provide written assurances regarding the types and amounts of medicinals used in feeds, and maintain records for the use of any medicated feed.
- Limit the use of medicinals under strict supervision of licensed veterinary expertise that accounts for responsible use of approved drugs, treatments and withdrawal times, and complies with guidelines for any use of new investigational animal drugs.
- Prepare and implement written procedures for non-medicinal use of chemicals (i.e., for disinfection or water treatment) to minimize risks to human health and risks of unacceptable emissions to the environment.
- Identify and list local parasite species that may infest farmed salmon and which are potentially transmissible to humans unless adequate control measures are put in place, and develop and implement written control procedures to minimize the risk of infestation, for example, by not using any raw feed ingredients unless they have been subjected to treatments known to kill any potentially harmful parasites.
- Maintain sanitation control procedures for transport waters, ice and containers to prevent contamination during transport or temporary holding. When fish are placed on ice at the farm at harvest, the process must be done properly, or the quality of the flesh can deteriorate. Alternating layers of ice and fish are recommended to avoid temperature fluctuations.

#### For Additional Information

##### Guide to Drug, Vaccine and Pesticide Use in Aquaculture

Federal Joint Subcommittee on Aquaculture Working Group on Quality Assurance in Aquaculture Production – 2007  
[http://www.extension.org/mediawiki/files/5/54/Drug\\_Guide\\_7-5-07.pdf](http://www.extension.org/mediawiki/files/5/54/Drug_Guide_7-5-07.pdf)

##### Food Safety Issues Associated With Products From Aquaculture

Report of a Joint FAO/NACA/WHO Study Group  
World Health Organization – 1999  
<http://www.who.int/foodsafety/publications/aquaculture/en/>

##### Responsible Use of Antimicrobials in Fish Production

Responsible Use of Medicines in Agriculture Alliance – 2007  
<http://www.ruma.org.uk/guidelines/antimicrobials/long/fishantimicrobialguidelineslong.pdf>

##### Judicious Use of Antimicrobials for Treatments of Aquatic Animals by Veterinarians

American Veterinary Medical Association  
<https://www.avma.org/KB/Policies/Pages/Judicious-Use-of-Antimicrobials-for-Treatment-of-Aquatic-Animals-by-Veterinarians.aspx>

## Prudent Use Guidelines: A Review of Existing Veterinary Guidelines

C. J. Teale and G. Moulin – 2012

<http://www.oie.int/doc/ged/D11824.PDF>

## Fish and Fishery Products Hazards and Controls Guidance

Department of Health and Human Services

U.S. Food and Drug Administration Office of Food Safety – 2011

<http://www.fda.gov/downloads/food/guidanceregulation/>

[ucm251970.pdf](http://www.fda.gov/downloads/food/guidanceregulation/ucm251970.pdf)

## Standards

- 11.1: Antibiotics or chemicals that are proactively prohibited in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish.
- 11.2: Documentation shall be available that states all fish in the farm have been grown from smolts reared without the use of proactively prohibited medicines such as malachite green or other substances prohibited in food animals.
- 11.3: Documents shall be available from feed manufacturers that state antibiotics or other drugs are not present in non-medicated feed, that provide details of drugs or antibiotics in medicated feeds and state that levels of heavy metals and PCBs/dioxins in feed are below limits for those compounds set by the countries in which the plants operate.
- 11.4: Documentation shall be available that identifies local parasite species that may infest farmed salmon and which are potentially transmissible to humans, and describes the control measures taken to minimize the risk of such infestation.
- 11.5: Antibiotics shall only be used to treat diagnosed bacterial disease (see also Standard 10.9) and shall not be used as growth promoters.
- 11.6: Where there is a discharge of potential contaminants within 5 kilometers of a farm, the farm shall check for that contaminant in the flesh of exposed fish on at least an annual basis and verify that levels are below those required by the exporting and importing countries.
- 11.7: Equipment and containers used to harvest and transport fish shall be clean and free of lubricants, fuel, metal fragments and other foreign material.
- 11.8: Ice in which fish are placed following harvest shall be made from potable water or seawater that has been disinfected to an equivalent standard.

## 12. Traceability

### Record-Keeping Requirement

To establish product traceability, the following data shall be recorded for each culture unit and each production cycle:

- culture unit identification number
- unit area or volume
- stocking date
- common and scientific names of fish
- quantity of smolts stocked
- source of smolts (hatchery)
- antibiotic and drug use
- herbicide and other pesticide use
- manufacturer and lot number for each feed used
- movement of fish among cages
- unusual events that could affect quality or safety
- results of tests for contaminants before harvest
- harvest date
- harvest method
- harvest quantity
- transport method
- processing plant(s) or purchaser(s).

### Reasons for Requirement

Product traceability is a crucial component of the BAP program. It connects the links in the production chain and allows tracing of each processed lot back to the culture unit and inputs of origin. Food quality and safety analyses by accredited labora-

tories can also be included. Traceability ultimately assures purchasers that all steps in the production process were in compliance with environmental, social and food safety standards.

### Implementation

Farms may utilize any traceability system that meets the BAP requirements. This can be an online system; a farm's own in-house database, paper records, files and documents; or a combination thereof.

Where paper records, documents or notebooks are used, if possible, the information should also be transferred to computer database files to allow electronic transmission. The original files or paper records shall be kept to allow for verification of the electronic data.

The record-keeping process requires a high degree of care and organization. At large farms, managers could collect initial data for those aquaculture products for which they are responsible. A single clerk or team could then be given the task of collecting the data from managers and transferring it to a computer database. Farm management shall, of course, review the effort at intervals to verify it satisfies BAP requirements.

### Product Identity Preservation

To assure the integrity of the Best Aquaculture Practices "star" system, traceability controls must be in place that allow verification of all facilities that contribute to the claim of multiple-star BAP-certified status.

To insure the proper separation and traceability of all farm inputs and outputs, the following components must be in place:

- Farms that purchase all of their smolts and feed from BAP-certified sources shall maintain records of the sources of stocking material and feeds used.
- Farms that purchase stocking material and feed from both BAP- and non-BAP-certified sources shall identify all sources and have adequate systems in place to prevent mixing of BAP and non-BAP production lots.
- To enable mass balance verification of multiple-star products, certified farms shall maintain a list, including harvest dates and volumes, of the facilities to which they sell or deliver products.
- The number of backward and forward trace exercises conducted by the auditor will be determined by farm volume.

## Standards

- 12.1: The facility shall operate an effective record-keeping system that provides timely, organized, accurate entries, performed and overseen by a designated trained person or team responsible for collecting the data, ensuring it is complete and accurate, and that traceability requirements are met.
- 12.2: The facility shall keep complete and accurate records for each culture unit and production cycle, including the culture unit identification number, unit area and volume, species stocked and, if applicable, species specifications such as triploid.
- 12.3: The facility shall keep complete and accurate records concerning any antibiotic, pesticide or other drug use at the farm.
- 12.4: Complete and accurate records regarding manufacturer and lot numbers for each feed used shall be maintained.
- 12.5: The facility shall maintain complete and accurate records of the sources and numbers of juvenile fish (smolts) stocked, stocking dates and all feeds used for each culture unit.
- 12.6: Complete and accurate records regarding the harvest date, harvest quantity, movement document number (if applicable) and receiving processing plant(s) or purchaser(s) shall be maintained. If product lots are destined to more than one plant or purchaser, each lot shall be separately identified.
- 12.7: In order to use the BAP logo, facilities shall have such use approved and registered in advance with BAP Management.
- 12.8: The facility shall keep records of any customer complaints related to its products' compliance with the BAP standards.
- 12.9: The facility shall keep records of investigations of such complaints and actions taken to address/correct them.
- 12.10: All records specified in Section 12 shall be retained for a period that exceeds both 12 months and the expected shelf life of the aquaculture products.

## BAP Logo Use

Use of the Best Aquaculture Practices logo, a registered trademark of the Global Aquaculture Alliance, for any purpose shall be approved by BAP in advance and used in compliance with the BAP trademark usage agreement.

## Customer Complaints

The applicant shall prepare and implement an effective system for the management of complaints and complaint data to control and correct shortcomings relating to its products' compliance with the BAP standards.

Sample Product Traceability Form

Farm Name		Cage Number		Cage Volume	
<b>SMOLTS</b>			<b>FEED</b>		
Stocking Date			Feed Type(s)		
Stocking Quantity			Manufacturer(s)		
Fish Name, Common					
Fish Name, Scientific			Lot Numbers		
Hatchery		BAP No.			
"No Banned Chemical Use" Statement Available?    Y    N			"No Banned Chemical Use" Statement Available?    Y    N		
<b>THERAPEUTIC DRUG USE</b>			<b>PESTICIDE USE</b>		
Compound 1			Compound 1		
Disease Treated			Condition Treated		
Application Rate			Application Rate		
Application Period			Application Period		
Compound 2			Compound 2		
Disease Treated			Condition Treated		
Application Rate			Application Rate		
Application Period			Application Period		
<b>MOVEMENT AMONG CAGES</b>					
<b>UNUSUAL EVENTS</b>					
<b>CONTAMINANT REST RESULTS</b>					
<b>HARVEST</b>			Harvest Purchaser Name/Address		
Harvest Date					
Harvest Method					
Harvest Quantity (kg)					
Transport Method					