



# Salmon Farms BAP Standards, Guidelines

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## Best Aquaculture Practices Facility Certification

### Background

The Responsible Aquaculture Program was established by the Global Aquaculture Alliance (GAA) in September 2000 as a voluntary, continuous improvement program to guide the industry toward environmentally and socially responsible practices. The initial elements of the program were the Guiding Principles for Responsible Aquaculture and the *Codes of Practice for Responsible Shrimp Farming*, published in 1999. Both are available from the Global Aquaculture Alliance.

Upon this foundation, GAA then began developing Best Aquaculture Practices (BAP) standards for fish and shellfish species. These are achievable, science-based and continuously improved global performance standards for the aquaculture supply chain to assure healthful foods produced through environmentally and socially responsible means.

### BAP Standards

BAP standards are developed through a transparent process by a committee composed of technical experts and representatives of those groups interested in or affected by the standards. Care is taken to ensure a balance among the different sectors of interest. Although not rigidly defined, these committees have a target composition of four industry representatives, four conservation or social justice non-governmental organizations and four representatives from academic, regulatory or policy groups. Standards undergo a public comment period and are subject to regular review and improvement. They adhere to international norms such as the FAO Technical Guidelines on Aquaculture Certification and the guidelines of the Global Food Safety Initiative.

BAP standards are comprehensive. They address a full range of issues, including environmental and social responsibility, animal health and welfare, food safety and traceability. They also address the entire value chain, including feed mills, hatcheries, farms and processing plants. The standards promote environmentally responsible use of land, water, nutrients and other resources for aquaculture production. Participants must be good neighbors within local communities and cooperate with other rightful users of land and water to minimize conflicts. Further, the BAP program assures that aquaculture production processes meet all necessary food safety requirements.

Adoption of BAP standards is voluntary and market driven. Compliance with the BAP standards is audited by ISO-accredited certification bodies. Certified facilities may use the "Best Aquaculture Practices Certified" mark on retail packaging to alert consumers to their compliance with the standards.

### Legal Compliance, Continuous Improvement

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

The BAP program strives to set standards at an achievable level to encourage a broad cross section of producers to participate. In this way, the beneficial impacts of the program are expected to spread more widely and accumulate more quickly than might be accomplished with a more elite approach targeted at the highest performers. Over time, the BAP standards are regularly improved. In this way, they constitute part of a continuum along which the industry as a whole can advance. BAP standards complement other certification programs that focus on specific subjects (animal welfare, fair trade, organic production, environmental issues) or performance segments.

The BAP standards seek, where possible, to measure performance numerically. However, in many cases, it is not possible to relate specific performance metrics to specific outcomes. Therefore, many BAP standards require demonstrated compliance with written facility procedures. While this calls for comprehensive documentation, it ensures that facility managers address all aspects of their operations and have written materials available as training aids for staff.

The standards specify key elements of written procedures while seeking to avoid prescribing practice details. This approach recognizes that there can be several ways of accomplishing targeted outcomes at facilities, and that regional differences in environment, culture or regulation often make differences in practices necessary.

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.

## **Certification Process**

To be certified as operating according to the BAP standards, aquaculture facilities must first apply to the Best Aquaculture Practices program of GAA and provide administrative and operational data. Individual facilities then undergo an audit by a representative of an ISO-accredited certification body for demonstrated compliance with the BAP standards. The audit process includes physical inspection, documentation reviews, personnel interviews and results from laboratory analyses.

The timing for annual BAP audits is decided by the auditor in conjunction with facility management. Where a company owns several farms in one area, audits are normally coordinated to make most efficient use of the auditor's time and minimize inconvenience to the facility.



# Salmon Farms BAP Standards, Guidelines

## BEST AQUACULTURE PRACTICES CERTIFICATION

The following Best Aquaculture Practices standards and guidelines apply to the cage and net pen production of Atlantic salmon, *Salmo salar*; chinook salmon, *Onchorynchus tshawytscha*; coho salmon, *Onchorynchus kisutch*; and rainbow trout, *Onchorynchus mykiss*. 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. For further information, please refer to the additional resources listed.

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

### Best Aquaculture Practices

P. O. Box 2530 – Crystal River, Florida 34423 USA

Telephone: +1-352-563-0565 – Fax: +1-425-650-3001

Web: [www.bestaquaculturepractices.org](http://www.bestaquaculturepractices.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 must 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 scheme, the auditor notifies the certification body and records this in the report. Verification of the implementation of corrective actions must be submitted to the certification body within 28 days of the evaluation. (Major non-conformities typically reflect issues with general policies.)

**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 must be submitted to the certification body within 28 days of the evaluation. (Minor non-conformities typically reflect general housekeeping issues.)

## 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 demonstration of 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 have been 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
- predator control permits
- protection of sensitive habitats
- protection of the rights of native peoples
- environmental impact assessments or reporting on fish health.

BAP auditors cannot know all laws 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 and aquaculture, water management, and transportation, as well as local aquaculture associations. BAP auditors must 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 will 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.

## 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 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 that 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.

## 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

Aquaculture farms are often located in rural areas, where some individuals may rely on varied natural resources to supplement their livelihoods. Some local residents benefit from employment or infrastructure improvements associated with large-scale aquaculture development, but others may face limited access to areas used for fishing or recreation.

### Implementation

Participants in the BAP program shall be good neighbors within local communities and cooperate with other rightful users of land and water to minimize conflicts. Farms are encouraged to communicate regularly with local leaders. They should also respond helpfully to public requests for information.

Farms shall provide barriers that limit entry by unauthorized persons and post signs that identify possible safety hazards. However, farm management should accommodate traditional uses of natural resources through a cooperative attitude toward established local interests and environmental stewardship.

During facility inspection, the auditor may verify compliance with this standard 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. The auditor should select the individuals for interview, rather than being provided a group of interviewees by farm man-

agement. By such interviews, auditors shall determine the helpfulness of the participant's responses.

### Area Management Agreements

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

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 a requirement for initial BAP certification in this version of the standard. 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.

## Standards

- 2.1: The applicant shall demonstrate that the farm does not prevent access to fishing areas and other public resources. Where access is not direct, the applicant must provide signage and a written access plan demonstrating consideration of biosecurity and employee and public safety.
- 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 must 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 (see Standards 4 and 10) with BAP-certified farms within an area twice the regulatory minimum separation distance to an upper limit of a 5-kilometer radius.

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.

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## 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 join a union or organize collective bargaining under the respective nation's 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. A written safety manual shall be available, and workers shall be trained in first aid and 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 training and certification of staff divers, and minimize daily dive frequency. 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 shall be well ventilated and not overcrowded or exposed to safety hazards. They shall provide adequate shelter and 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 Standard 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.

## Standards

- 3.1: The applicant shall meet or exceed the minimum wage rate, including benefits, required by local and national labor laws.
- 3.2: The applicant shall comply with all other national and local labor laws.
- 3.3: The applicant shall have a verifiable employment policy written in the employees' predominant language that bans forced and bonded labor, and child labor shall never be used outside the existing ILO conventions and standards.
- 3.4: The applicant's employment policies shall allow employees to join a trade union or organize collective bargaining under the national laws, and report grievances without repercussions.
- 3.5: The applicant shall make provisions for medical treatment, either through a national workers compensation program or other means that provides the same benefits, and pay wages to employees who cannot work because of injuries sustained at work.
- 3.6: The applicant shall comply with local laws regarding severance payments to full-time employees who are made redundant through no fault of their own. Employees shall receive payment of two weeks wages for every year worked to a maximum of 20 weeks, where no such laws exist or where the law provides for less than this minimum benefit.
- 3.7: Casual or short-term workers shall receive wages, regulated/legislated benefits, training and rights similar to the terms for other employees.
- 3.8: All workers shall receive equivalent and appropriate training for their assigned tasks at the start of their employment, as well as on safety procedures and the use of boats and associated equipment.
- 3.9: All 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.
- 3.10: The applicant shall provide basic medical care, as well as access to or communication with medical authorities, in the case of emergencies or accidents.
- 3.11: An emergency response plan shall outline the timely evacuation of personnel from remote locations, if necessary, due to medical emergency, natural disaster or other major problem.
- 3.12: Protective gear and equipment in 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).
- 3.13: A first aid kit shall be readily available to employees, with all medical supplies within their use-by dates.
- 3.14: The applicant and diving contractors hired by the applicant shall comply with laws that govern diving on fish farms or apply a dive safety plan that requires diver training and certification.
- 3.15: The dive safety plan shall include procedures that minimize the frequency of ascents during the diving day.
- 3.16: The dive safety plan shall require the maintenance of dive logs that document procedures and safety-related incidents.
- 3.17: The dive safety plan shall require records on equipment maintenance, and dive safety equipment shall include the availability of bottled oxygen.

- 3.18: The applicant shall provide written procedures and staff training for diving emergencies such as decompression sickness, and regularly audit records and procedures.
- 3.19: The dive safety plan shall require regular internal audits of dive procedures, equipment and dive logs.
- 3.20: If provided, employee housing shall meet local and national standards (e.g., water-tight structures, adequate space, heating/cooling).
- 3.21: If provided, employee housing shall be free of accumulated trash and garbage.
- 3.22: A sufficient supply of potable drinking water shall be readily available to employees.
- 3.23: Running water, toilets and washing/shower facilities shall be available to employees at the farm or on workboats, or onshore where farms are located close to the shore.
- 3.24: If provided, meals shall be wholesome and commensurate with local eating customs.
- 3.25: Subcontractors who work on the farm shall provide documents to prove they are legally licensed or registered to work in the relevant jurisdiction, and records of subcontracting shall be maintained.
- 3.26: Applicants shall have a written safety policy for subcontractors that determines and documents the risk and the need for safety training depending on what the subcontractor is required to do and for how long, and shall document safety training has been given to subcontractors.

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

Note: It is expected that an ISO standard for environmental monitoring of the seabed impacts from marine finfish farms will be finalized within two years. At that time, it may be appropriate to require its protocols for this BAP standard. The ISO guidelines will be kept under review by the Best Aquaculture Practices program, and the above requirements shall apply in the meantime.

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 Legal Compliance, Continuous Improvement, page 1) 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.

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 organic build-up on the seabed within this zone by the method deemed best for the type of sediment that exists there. The choice of method shall be justified by prior documentation of the type of sediments over which the farm is located.
- Conduct sediment sampling to coincide with the period of peak feeding during each crop cycle. (Note: Standard 10 requires single year class stocking for fish health reasons. Therefore, all BAP-certified farms must operate on a cyclical production schedule). Samples shall be taken along at least two transects that pass directly through the farm and that align with the dominant flow of water at the farm site. One sample with five replicates shall be taken at the edge of the farm and another at the 25-meter or 40-meter boundary (see above).

- Five replicate samples shall also be taken from at least two reference stations within 1 kilometer of the farm that have similar depth and sediment characteristics as occur at the farm and where there is no other salmon production.
- Demonstrate by statistical analysis of the results that there is no organic build-up at the boundary of the allowable sediment impact zone by comparison to the reference station, as determined by the monitoring method chosen.
- Collect and store data from which the farm's feed-based carbon and nitrogen discharges can be calculated for possible future submission to the BAP 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 (Standard 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 Legal Compliance, Continuous Improvement, page 1) for use in future GAA-sponsored research to evaluate the desirability of such a protocol. Development of mechanisms for establishing the confidentiality and anonymity of the sources of such data shall precede implementation of this requirement and shall be undertaken in cooperation with existing BAP-certified farms.

## Additional Information

### Australia Marine Farm License Conditions, Schedule 3

#### Farm Site Inspection Checklist

British Columbia Salmon Farmers and Province of British Columbia – 2001  
<http://www.salmonfarmers.org>

## **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

## **Norwegian Standard N.S. 9410.E**

Environmental Monitoring of Marine Fish Farms

## **Code of Good Practice for Scottish Finfish Culture**

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

## **Washington State Legislature, WAC 173-204-420**

Sediment Impact Zone Maximum Criteria  
<http://apps.leg.wa.gov/WAC/default.aspx?cite=173-204-200>

## **FAO Fisheries and Aquaculture Technical Paper No. 527**

Environmental Impact Assessment and Monitoring in Aquaculture, pp. 455–535  
A. Wilson, S. Magill, K. D. Black – 2009  
FAO  
Rome, Italy

## **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: 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.
- 4.5: 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.
- 4.6: 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.
- 4.7: Data that will enable the farm’s feed-based carbon and nitrogen discharge to be calculated shall be collected and recorded, and may be required to be submitted to the BAP database for future use in BAP-sponsored research (see Legal Compliance, Continuous Improvement, page 1).
- 4.8: Production cycles, fallowing and nutrient monitoring shall be coordinated with the other neighboring BAP applicants or certified farms, or with members of an established AMA (see Standard 2).

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## **5. Environment**

### **Fishmeal and Fish Oil Conservation**

**Farms shall use feeds and feed ingredients produced by responsible methods, accurately monitor feed inputs and make efficient 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 with significant biomass that are commonly used in animal feeds, 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 shall come from sources identified as responsibly managed 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

The Best Aquaculture Practices certification program includes standards for feed mills. These are designed to work in tandem with the BAP standards for salmon farms to provide assurances regarding the feed and feed ingredients used.

Where a farm buys its feed from a BAP-certified feed mill, this provides the necessary assurance regarding responsible sourcing of fishery and other ingredients. In other cases, farms shall obtain documents from feed suppliers that assure all ingredients meet responsible sourcing standards equivalent to the BAP feed mill standards.

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% and of all marine-derived ingredients used at inclusion rates over 1%. For each year class of fish, farmers shall record the characteristics and amounts of each feed used and the total fish production.

## “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.

Initially, BAP-certified salmon producers shall obtain fish in:fish out ratios below 2.0. By 2016, they shall obtain ratios below 1.5.

## 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 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 should include any meal or oil derived from wild-caught fish, squid, krill, mollusks or any other wild marine animals. However, they should 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 15.0% fish oil and 25.0% 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 = (15.0 + 25.0) ÷ (22.5 + 5.0) = 1.45

Thus, for an FCR of 1.2, FIFO = 1.45 x 1.2 = 1.7.

## Additional Information

### Best Aquaculture Practices Feed Mill Standards

<http://www.gaalliance.org/cmsAdmin/uploads/BAP-FeedMill-610.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.iffonet.net/downloads/IFFO%20RS/IFFO%20RS%20Booklet.pdf>

### Fish In:Fish Out Ratios Explained

Andrew Jackson – 2009

International Fishmeal and Fish Oil Organisation.

<http://www.iffonet.net/downloads/100.pdf>

### The State of World Fisheries and Aquaculture

FAO Fisheries and Aquaculture Department – 2006  
<ftp://ftp.fao.org/docrep/fao/009/a0699e/a0699e.pdf>

## Standards

- 5.1: The applicant shall source feed from a BAP-certified feed mill or a feedmill 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 FCR for each year class.
- 5.5: The facility shall calculate and achieve a final fish in:fish out ratio of 2.0 or less for the most recent year class harvested.
- 5.6: **(Future standard)** After June 1, 2016, the facility shall calculate and achieve a final fish in:fish out ratio of 1.5 or less for the most recent year class harvested.

## 6. 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, which can tear nets and lead 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 lead to 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:

- 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 that 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 (Standard 7).
- Boat equipment that includes guards on propellers and staff training procedures that minimize the risk of contact between boats and farm nets (see Standard 3).
- 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 escapes, 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 entered into the BAP Salmon Database (see Legal Compliance, Continuous Improvement, page 1) and shared with other farms in an AMA, where such an agreement is in place, and with BAP-certified farms in the area (see Standard 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, a projection shall be prepared immediately of the number of fish expected to be harvested in each year class, 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 this matter was considered specifically by regulators in granting operating permits and approvals, and that such consideration was backed by an independent environmental analysis.

For the purposes of this implementation guideline, "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/reports/.../ices%20code%20of%20practice%202005.pdf>

## Marine Fish Farms N.S. 9415

<http://www.standard.no/en/Nyheter-og-produkter/Campaigns/Fiskeri-landbruk-og-mat/Marine-fish-farms/>

## New Brunswick Salmon Growers Code of Containment, Standard Operating Procedures

## Technical Requirements for Fish Farming Installations

Norwegian Ministry of Fisheries and Coastal Affairs  
NYTEK

## General Permit Atlantic Salmon Aquaculture Maine Pollution Discharge Elimination System Permit, Part II Special Conditions

State of Maine Department of Environmental Protection – 2008

## 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 in the implementation requirements.
- 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.
- 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 less than  $\pm 3\%$  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 that the species of salmon being 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 the Introductions and Transfers of Marine Organisms.

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## 7. Environment

### Predator and Wildlife Interactions

**Farms shall manage physical interactions with wildlife and not reduce the biodiversity of other 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 standard, these interactions are defined as "physical interactions" distinguished from the "biological interactions" with wild salmon addressed in Standards 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, 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 following requirements, 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 that 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 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 not be limited to:

- A list of relevant local laws and specific conditions of the farm’s operating permits that apply to wildlife management and protection.
- A list of local species classified as endangered or threatened under local laws and/or listed as “Critically Endangered” or “Endangered” on the IUCN Red List.
- A map that identifies officially designated “critical” and/or “sensitive” marine and coastal habitat in the region. If the farm is in an area so designated, a list of the classified or endangered sedentary species within a 2-kilometer radius of the farm and of mobile coastal species within the region, 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 member of staff to carry out lethal

control measures, if needed, and for training of that individual in humane slaughter methods.

- Description of the farm’s passive measures to deter the entry into cages of predatory birds or 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 any active but non-lethal deterrent measures 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 Legal Compliance, Continuous Improvement, page 1).
- 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 that deliberate lethal controls on species classified as endangered or threatened are not to be used except under exceptional circumstances, such as risk to human life, and then only after specific written authorization is obtained from 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 have a written Wildlife Interaction Plan consistent with the implementation requirements above and that complies with the procedural, performance and reporting requirements therein.
- 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 only use lethal methods of control 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.
- 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 is 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.
- Refueling and 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 mechanical in situ net cleaning systems as their practicality is proved and shall demonstrate this by diminishing use of toxicant-based antifoulants.

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 first review of these standards.

#### For Additional Information

##### USDA NRCS AL Guide Sheet No. AL 701

Spill Prevention Control and Countermeasures  
Available online at <http://www.al.nrcs.usda.gov/SOsections/Engineering/BMPindex.html>

## Standards

- 8.1: The applicant shall have a written Material Storage, Handling and Waste Disposal Plan that meets the BAP requirements for proper handling and disposal as outlined in the implementation requirements.
- 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 that are 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, and 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 to comply with local regulations and 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 switching from 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 annual reduction of at least 20% in the use of toxicant-based antifoulants per ton of fish produced.

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## 9. Animal Health and Welfare

### Health and Welfare

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

### Reasons for Standard

Fish may experience distress from various causes, including 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. 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 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 (Standard 10).

Farms must 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. Reports of behavioral distress shall be followed up by trained personnel 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 rapid opercula 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.

Dead fish must 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 rapidly employ them.
- Provision of equipment to maintain and monitor dissolved-oxygen levels at 80 to 100% 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.

## 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 be subject to the requirements for documentation specified in Standard 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 is in accordance with applicable local and state regulations and/or the provisions of Standard 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 shall limit other sources of outside disturbances.
- 9.8: The applicant shall have a written Water Quality Management Plan consistent with the implementation requirements above and be able to demonstrate compliance with it.
- 9.9: The applicant shall apply stocking density criteria based on local conditions, which shall normally be at or below an average 25 kg/m<sup>3</sup> but may rise higher than this for 5% of the production cycle if the fish show other good welfare indicators and water quality is considered good.

Average farm stocking density shall not normally exceed 25 kg/m<sup>3</sup> but may be allowed to rise higher for up to 5% of the production cycle if the fish show other indicators of good welfare such as low mortality and if water quality is considered good. 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. They shall be stunned immediately 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 stocking density controlled according to prevailing conditions. Dissolved oxygen levels shall be maintained above 80% 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 shall not exceed 15% fish volume/water volume. These harvesting provisions shall apply equally to farm staff and subcontractors.

## For Additional Information

### Farm Animal Welfare Council

<http://www.fawc.org.uk/freedoms.htm>

### Welfare Standards for Farmed Atlantic Salmon

Royal Society for the Prevention of Cruelty to Animals – 2007  
<http://www.rspca.org.uk/sciencegroup/farmanimals/standards>

### FastFish Website

<http://fastfish.imr.no> and

[http://fastfish.imr.no/\\_\\_data/page/7764/FASTFISH\\_Publishable\\_Final\\_Activity\\_Report\\_draft\\_1.pdf](http://fastfish.imr.no/__data/page/7764/FASTFISH_Publishable_Final_Activity_Report_draft_1.pdf)

- 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 (Standard 2) in which salmon farmers coordinate their activities with neighboring farms.

Additionally, the fish health professional shall ensure compliance with all legal requirements for disease testing, fish movements (including zoo-sanitary 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:

- Assurance that only smolts certified clinically healthy and free of diseases and parasites specified in applicable national fish health legislation 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 quickly help.

#### Diagnosis, Treatment

Written procedures for fish diagnosis and treatment shall include:

- Monitoring for endemic 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 veterinary professional practices (see Additional Information), for how medicinal treatments (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 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, and that they include monitoring of sea lice loads and the setting of treatment trigger thresholds that take into account key factors such as season, the life cycle stages of farmed and wild fish, and the specific characteristics of the area in question.

## For Additional Information

### American Veterinary Medical Association Judicious Use of Antimicrobials for Aquatic Veterinarians

The Food and Drug Administration Center for Veterinary Medicine  
<http://www.fda.gov/cvm>

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

Chang et al. – 2007  
<http://www.nbsga.com/science/2722%20BMA%20Final.pdf>

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

[http://www.marlab.ac.uk/Delivery/Information\\_resources/information\\_resources\\_view\\_document.aspx?resourceId=31142&documentId=389](http://www.marlab.ac.uk/Delivery/Information_resources/information_resources_view_document.aspx?resourceId=31142&documentId=389)

### Protection, Control and Eradication Measures for High-Risk Disease in Aquaculture Regulation (RESA)

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

### Responsible Use of Antimicrobials in Fish Production

Responsible Use of Medicines in Agriculture Alliance  
Updated 2007  
<http://www.ruma.org.uk>

### World Veterinary Association Policy on the Prudent Use of Antibiotics

World Veterinary Association  
<http://www.worldvet.org/manuals/T-3-2.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 Standard 2). 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.
- 10.4: The fish health professional shall ensure compliance with all legal requirements for disease testing, fish movements (including zoo-sanitary 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 shall be free from diseases and parasites, and 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 Standard 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 Legal Compliance, Continuous Improvement, page 1).
- 10.12: If the applicant is a member of an AMA (Standard 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. Banned antibiotics, drugs and other chemical compounds 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 banned, 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 involve 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 prohibited in food animals 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 (Standard 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 investigational new 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 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 – 1994  
Texas Agricultural Extension Service College Station  
Texas, USA

April 2007 revision – <http://www.aquanic.org/jsa/wgqaap/drugguide/drugguide.htm>

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

Report of a Joint FAO/NACA/WHO Study Group  
World Health Organization – 1999  
Geneva, Switzerland

#### Responsible Use of Antimicrobials in Fish Production

Responsible Use of Medicines in Agriculture Alliance – 2004  
<http://www.ruma.org.uk/guidelines/antimicrobials/long/fishantimicrobialguidelineslong.pdf>

#### Judicious Use of Antimicrobials for Aquatic Veterinarians

Food and Drug Administration Center for Veterinary Medicine  
American Veterinary Medical Association  
<http://www.avma.org/reference/jtua.asp>

#### WVA Policy on the Prudent Use of Antibiotics

World Veterinary Association  
IFAP – FIPA and COMISA – 1999  
<http://www.worldvet.org/manuals/T-3-2.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/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/Seafood/FishandFisheriesProductsHazardsandControlsGuide/default.htm>

## Standards

- 11.1: Antibiotics or chemicals banned in the producing or importing country shall not be used in feeds or any treatment that could result in harmful residue in fish.
  - 11.2: Documentation shall be available that states all fish in the farm have been grown from smolts reared without the use of banned medicines such as malachite green or other substances prohibited in food animals.
  - 11.3: Documentation shall be available from feed manufacturers that antibiotics or other drugs are not present in non-medicated feed, and 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 10.8) 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.
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## 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 or purchaser\*.

(\* Data required for optional online traceability system.)

### Reasons for Requirement

Product traceability is a crucial component of the BAP program. It interconnects links in the fish 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 can maintain paper records of the required data in notebooks or files. If possible, the information should also be transferred to computer database files, with the original files kept to allow verification of the electronic data.

Required information and other records can initially be captured on the sample form on the following page. Each form corresponds to the harvest on a particular day from a particular culture unit.

Where the facility claims inputs such as feed or juveniles from other BAP-certified facilities, segregation of the BAP inputs and outputs, and accompanying records, are required. In addition, some buyers request that chain of custody data be added to the BAP online traceability database via the Internet. Participation in the online system is optional. On-site audits include chain of custody verification of records and product segregation.

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

## Standards

Traceability records shall be maintained for each of the specified parameters for every production unit and every production cycle to allow tracing of fish back to the unit and inputs of origin.

**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 Number(s)	
Hatchery	BAP No.		
"No Banned Chemical Use" Statement Available? Y N		"No Banned Chemical Use" Statement(s) 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 TEST RESULTS</b>			
<b>HARVEST</b>		Harvest Purchaser Name/Address	
Harvest Date			
Harvest Method			
Harvest Quantity (kg)			
Transport Method			